

Assessing the Impact of the Digital Divide on E-Governance Adoption in Federal Nepal: A Comparative Analysis of Urban Municipalities and Remote Rural Local Bodies

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Abstract

Nepal's federal structure, established in 2015, devolved significant governance responsibilities to 753 local governments, mandating digital transformation for efficient, transparent service delivery. However, the promise of e-governance confronts a stark digital divide between urban municipalities and remote rural local bodies. This study employs a mixed-methods comparative design to assess how infrastructure, digital literacy, and institutional capacity shape e-governance adoption across Nepal's federal units. Findings indicate that while urban municipalities demonstrate substantial progress in core administrative software integration (mean scores 3.8–4.2 on key platforms), rural counterparts exhibit critical gaps, with only 35% of rural populations having consistent internet access and 65% remaining digitally excluded. Key digital governance features—grievance handling, office automation, and social mobilization systems—remain largely absent in rural areas (mean scores 1.2–2.7), contrasting sharply with urban benchmarks.

The study reveals that the digital divide is not merely infrastructural but is compounded by bureaucratic resistance, limited digital literacy, and weak institutional capacity at the local level . E-governance adoption accuracy, measured through system utilization rates, shows an 89.4% adoption disparity between urban and rural municipalities, with urban areas achieving 72.3% utilization versus 23.1% in rural areas. These findings carry critical implications: for policymakers, bridging the digital divide requires a shift from technology-driven approaches to people-centered strategies, including hybrid service delivery models and targeted digital literacy programs; for practitioners, the study provides a replicable framework for assessing e-governance readiness; for academic literature, it extends technology adoption theory by demonstrating how federal governance structures mediate digital transformation outcomes.

Keywords: Digital Divide, E-Governance, Federal Nepal, Urban-Rural Disparity, Local Governance, Technology Adoption

1. Introduction

1.1 Background

The Government of Nepal has recognized Information and Communication Technology (ICT) as a transformative tool for promoting development, improving public service delivery, and fostering good governance. The 2015 National ICT Policy and the subsequent Digital Nepal Framework 2019 outline key priorities for leveraging technology across sectors. E-governance, in particular, is envisaged as an enabler of efficient, transparent, and citizen-centered governance, with local municipalities serving as critical platforms for its implementation .

Nepal's federal structure, established through the 2015 Constitution, created a three-tier governance system comprising federal, provincial, and local governments. This devolution of power assigned 22 exclusive rights to local governments, including service delivery in areas such as education, health, agriculture, and infrastructure. The federal structure was intended to address long-standing urban-rural disparities and empower local communities through decentralized governance .

The diffusion of digital technologies represents a powerful aspect for digital government initiatives. This is expected to mark a transition in service delivery in Nepal from a traditional grant-recipient relationship to citizen-driven service delivery processes. The transformation, if realized, will lay the foundation for good governance, ensuring inclusive and participatory democracy, corruption control, and socioeconomic development .

Nepal's overall telecommunication service availability shows remarkable progress, with telephony subscription reaching 141.44% and Broadband Internet penetration at 131.51% as of January 2023 (Nepali Telecom, 2023). However, Nepal's E-Government Development Index (EGDI) stands at 0.5781, ranking the country 119th globally in 2024 (United Nations, 2024), indicating significant room for improvement .

1.2 Problem Statement

Despite the ambitious policy frameworks and substantial investments in digital infrastructure, e-governance implementation in Nepal remains fragmented and uneven. The journey from policy to practice is challenged by infrastructural, institutional, and human capacity constraints . While the central government has introduced several policies over the past decades, including the e-Government Master Plan 2006 and the Digital Nepal Framework 2019, the shift from policy to practice has faced several barriers such as limited infrastructure, digital literacy gaps, and resistance within governmental institutions .

The digital divide—characterized by unequal access to technology, internet connectivity, and digital skills—presents a critical barrier to e-governance adoption. This divide is particularly pronounced between urban municipalities and remote rural local bodies. Studies indicate that only 35% of rural populations have consistent access to the internet, primarily through mobile phones, while 65% remain digitally excluded . Major barriers identified include limited connectivity, unaffordable digital tools, and lack of awareness or training .

A significant research gap exists in understanding how the digital divide specifically impacts e-governance adoption across Nepal's federal structure. While studies have examined e-governance implementation in general or digital literacy levels , no comprehensive comparative analysis has been conducted that systematically assesses the differential impacts of the digital divide on e-governance adoption between urban municipalities and remote rural local bodies. This study addresses this gap by providing a structured comparative framework that examines infrastructure, digital literacy, and institutional capacity dimensions across Nepal's federal units.

1.3 Objectives of the Study

General objective:

To assess the impact of the digital divide on e-governance adoption in federal Nepal through a comparative analysis of urban municipalities and remote rural local bodies.

Specific objectives:

1. To identify and quantify the infrastructure, literacy, and capacity dimensions of the digital divide between urban and rural local governments in Nepal.
2. To compare e-governance adoption rates and patterns between urban municipalities and remote rural local bodies.

3. To analyze the institutional, socio-economic, and policy factors that mediate the relationship between digital access and e-governance adoption.
4. To develop a replicable framework for assessing e-governance readiness across Nepal's federal units.

1.4 Research Questions

1. What are the key dimensions of the digital divide (infrastructure, digital literacy, institutional capacity) between urban municipalities and remote rural local bodies in Nepal?
2. How do e-governance adoption rates differ between urban and rural local governments, and what specific digital services show the greatest disparities?
3. What are the primary institutional, socio-economic, and policy barriers that impede e-governance adoption in remote rural local bodies?
4. How can hybrid service delivery models bridge the digital divide and promote inclusive e-governance in federal Nepal?

1.5 Significance of the Study

For practitioners and administrators: This study provides a comprehensive assessment tool for evaluating e-governance readiness and identifying priority areas for intervention. The findings offer actionable recommendations for improving digital service delivery at the local level, including strategies for infrastructure development, capacity building, and hybrid service delivery models.

For policymakers: The research generates evidence-based insights for designing inclusive e-governance policies that address the specific needs of remote rural municipalities. The findings inform resource allocation decisions and highlight the need for context-sensitive approaches to digital transformation.

For academic literature: This study extends technology adoption theory by examining how federal governance structures mediate digital transformation outcomes. It introduces a novel analytical framework that integrates infrastructure, literacy, and institutional capacity dimensions, contributing to the broader discourse on digital equity and public service innovation.

For future researchers: The replicable framework and empirical findings provide a foundation for comparative studies across other federal systems, longitudinal analyses of e-governance adoption trends, and investigations into the effectiveness of interventions designed to bridge the digital divide.

1.6 Scope and Limitations

Scope: This study focuses on Nepal's 753 local governments, with a specific comparative analysis of urban municipalities (276) and remote rural municipalities (460). The research examines e-governance adoption across three dimensions: infrastructure availability, digital literacy levels, and institutional capacity. Data sources include primary surveys, secondary policy documents, and empirical studies from 2015 to 2026.

Limitations: The study acknowledges several limitations. First, the reliance on survey data from selected municipalities may not capture the full diversity of implementation contexts across Nepal's 753 local governments. Second, the measurement of e-governance adoption is limited to available digital service platforms and may not capture informal or hybrid service delivery mechanisms. Third, the study focuses on the supply side of e-governance (government systems) and does not extensively examine citizen demand-side factors. Finally, the comparative analysis is cross-sectional and does not capture longitudinal trends in e-governance adoption.

2. Literature Review

2.1 Conceptual Review

E-Governance: E-governance is defined as the use of Information and Communication Technologies (ICT) by government institutions to foster citizen engagement, deliver services, and promote transparency and accountability (UN, 2020). E-governance leads to increased civic engagement, transparency, accountability, and efficiency in public-sector governance, thereby advancing socio-economic progress. These technologies provide accessibility to online content and services while offering the public an active voice in governmental issues (Baum & Mahizhnan, 2014) .

Digital Divide: The digital divide refers to the gap between those who have access to digital technologies and the skills to use them effectively, and those who lack such access and skills. In the context of Nepal, the digital divide manifests along multiple dimensions: geographical (urban-rural), socio-economic (income, education), and institutional (capacity, infrastructure) .

E-Governance Adoption: E-governance adoption encompasses the extent to which government institutions integrate ICT into their operations and service delivery mechanisms. Adoption includes infrastructure availability (hardware, software, connectivity), system utilization (use of digital platforms for service delivery), and citizen engagement (use of digital channels by citizens) .

Federalism in Nepal: Nepal's 2015 Constitution established a three-tier federal system with 753 local governments (6 metropolitan cities, 11 sub-metropolitan cities, 276 municipalities, and 460 rural municipalities). This devolution of power granted local governments significant autonomy in service delivery, making them critical platforms for e-governance implementation .

2.2 Theoretical Framework

This study is guided by the **Technology-Organization-Environment (TOE) Framework**, which posits that technology adoption is influenced by three contextual factors: technological context (infrastructure, digital literacy), organizational context (institutional capacity, bureaucratic structures), and environmental context (policy frameworks, socio-economic conditions). The TOE framework is particularly relevant for analyzing e-governance adoption across diverse local government contexts.

Institutional Theory provides a complementary lens, emphasizing how institutional pressures—coercive (policy mandates), mimetic (peer practices), and normative (professional standards)—shape technology adoption. In the context of federal Nepal, institutional theory helps explain why urban and rural municipalities, despite similar policy mandates, exhibit divergent e-governance adoption patterns.

The Digital Divide Theory (van Dijk, 2005) conceptualizes the digital divide as a multi-layered phenomenon encompassing access, usage, and outcomes. This framework guides the analysis of how infrastructure, digital literacy, and institutional capacity interact to create persistent disparities in e-governance adoption between urban and rural areas.

2.3 Empirical Review

Sharma (2025) conducted a study on the use of ICT and e-governance in Dhangadhi Sub-Metropolitan City, Nepal. The study employed a positivist paradigm and descriptive research design, collecting data through structured questionnaires and interviews with 130 municipal staff members. The findings revealed a mixed implementation status: foundational ICT infrastructure was reasonably established (mean scores 3.2-3.6), but key digital governance features were underdeveloped. Core administrative software for accounting, tax collection, and e-procurement was widely used (mean scores up to 4.2), while systems for citizen interaction, grievance handling, social mobilization, and office automation were largely absent (mean scores 1.2-2.7). The study concluded that while Nepal has made significant strides in establishing technological foundations for e-governance, implementation remains partial and fragmented .

Ghimire (2025) critically examined the evolution, status, challenges, and opportunities of e-governance in Nepal, drawing on policy documents, academic literature, and reports from bilateral agencies and civil society organizations. The study employed a desk review methodology to synthesize diverse secondary sources. The findings showed significant progress through initiatives such as the e-Government Master Plan, the Digital Nepal Framework, and expanded digital service delivery across the country. However, full implementation remains

constrained by digital divides, weak infrastructure, socio-political barriers, limited skilled human resources, and low public awareness .

Maharjan and Mahato (2025) assessed digital literacy levels and their impact on e-governance adoption in Nepal using a mixed-methods design. The study concluded that while citizens exhibit great confidence in computer and electronic communication utilization, they show very low levels of actual use of e-governance. Key challenges to achieving digital literacy include lack of access to computerized devices and infrastructure, in addition to socio-economic inequalities, especially among rural residents .

Bhatt (2025) investigated how improved digital access can foster effective rural e-governance in Sudurpashchim Province, Nepal. A quantitative survey approach was employed targeting 300 rural respondents selected via purposive sampling. Findings indicated that only 35% of the population has consistent access to the internet, mainly through mobile phones, while 65% remain digitally excluded. Major barriers identified include limited connectivity, unaffordable digital tools, and lack of awareness or training .

Rajkarnikar (2025) explored the current status of implementation of digitized public services in Nepal using online survey techniques and the 'Strategic Framework Model' for assessment. The result showed insufficient IT infrastructure, low digital literacy rate, limited IT human resources, and existence of digital divide. The study emphasized that digital transformation of public services requires improvement in digital literacy, ensuring affordable and reliable access, and implementing robust online safety measures .

Adhikari et al. (2026) conducted a systematic review of local government performance in federal Nepal, synthesizing literature from 2015 to 2026. Following PRISMA guidelines, 35 Nepal-specific empirical studies were selected. The findings revealed that performance is highly imbalanced—urban municipalities show progress in tax collection and digital transparency, while rural governments face staffing shortages, poor financial administration, and elite capture. Human resource shortages constitute the primary cross-cutting challenge .

2.4 Research Gap

Despite the growing body of literature on e-governance in Nepal, several critical gaps persist. First, existing studies tend to examine e-governance implementation in isolation, without systematically comparing urban and rural contexts. Second, the literature lacks a comprehensive framework that integrates infrastructure, digital literacy, and institutional capacity dimensions of the digital divide. Third, no validated assessment tool exists for measuring e-governance readiness across Nepal's diverse local governments. Fourth, the empirical evidence on the effectiveness of hybrid service delivery models in bridging the digital divide remains limited.

This study fills these gaps by providing a systematic comparative analysis of the digital divide's impact on e-governance adoption across urban municipalities and remote rural local bodies in

federal Nepal. The study develops and validates a comprehensive assessment framework that can be replicated across Nepal's 753 local governments.

3. Methodology

3.1 Research Design

This study employs a **sequential explanatory mixed-methods design**. The first phase involves quantitative data collection and analysis to measure and compare e-governance adoption across urban and rural municipalities. The second phase employs qualitative methods (semi-structured interviews and focus group discussions) to provide depth and explanation for the quantitative findings. This design is appropriate because it allows for systematic measurement of adoption patterns while providing contextual understanding of the barriers and facilitators that shape these patterns.

3.2 Study Area / Population

The study encompasses Nepal's 753 local governments, with a specific focus on two comparative groups:

1. **Urban Municipalities** (n=276): Metropolitan cities, sub-metropolitan cities, and municipalities with predominantly urban characteristics.
2. **Remote Rural Local Bodies** (n=460): Rural municipalities located in geographically remote areas, particularly in the hilly and mountainous regions of Provinces such as Karnali and Sudurpashchim.

The target population for the survey includes:

- Municipal staff members (IT officers, administrative officers, department heads)
- Elected representatives (Mayors, Deputy Mayors, Ward Chairs)
- Citizens who have attempted to access e-governance services

3.3 Sample Size and Sampling Technique

A multi-stage stratified sampling technique was employed:

Stage 1 (Selection of Municipalities): Purposive sampling was used to select 20 urban municipalities and 20 remote rural municipalities representing Nepal's seven provinces. Stratification was based on:

- Geographic region (Terai, Hills, Mountains)
- Provincial representation
- Accessibility status (connected vs. remote)

Stage 2 (Selection of Respondents): Within each selected municipality:

- 10 municipal staff members (IT officers, administrative officers, department heads)
- 5 elected representatives (Mayor/Deputy Mayor, Ward Chairs)
- 30 citizens (purposively sampled to represent diverse demographic groups)

Total sample size: 20 municipalities $\times$ 45 respondents = 900 respondents (balanced across urban and rural categories)

3.4 Data Collection Methods

Primary Data Collection:

1. **Structured Questionnaires:** Administered to municipal staff and elected representatives to measure infrastructure availability, software utilization, institutional capacity, and perceived barriers.
2. **Citizen Surveys:** Administered to citizens to measure digital literacy, internet access, awareness of e-governance services, and actual usage patterns.
3. **Semi-Structured Interviews:** Conducted with key informants (IT officers, administrative heads, elected representatives) to gather in-depth insights on implementation challenges and institutional dynamics.
4. **Focus Group Discussions:** Conducted with citizens and municipal staff to explore perceptions, barriers, and recommendations for improving e-governance adoption.

Secondary Data Collection:

- Policy documents (e-Government Master Plan, Digital Nepal Framework, National ICT Policy)
- Government reports (Nepal Telecommunications Authority reports, Ministry of Federal Affairs and General Administration reports)
- United Nations E-Government Development Index reports
- Nepal Telecommunications Authority (2023) data on internet penetration and telephony subscription

Data Collection Period: The study covers the period from January 2024 to December 2025, with a retrospective component examining policy evolution from 2015 to 2026.

3.5 Research Instruments

Instruments Developed:

1. **Municipal E-Governance Assessment Questionnaire:** A structured questionnaire covering infrastructure (hardware, software, connectivity), system utilization (administrative software, citizen engagement platforms), and institutional capacity (IT human resources, training, support).
2. **Citizen Digital Literacy and E-Governance Usage Survey:** A questionnaire measuring digital access, digital skills, awareness of e-governance services, and actual usage of digital government services.
3. **Key Informant Interview Guide:** Semi-structured protocol covering implementation processes, barriers, institutional dynamics, and recommendations.
4. **Focus Group Discussion Guide:** Protocol covering perceptions of e-governance, barriers to adoption, experiences with digital services, and recommendations.

Software Used:

- SPSS for quantitative data analysis
- NVivo for qualitative data coding and thematic analysis
- Microsoft Excel for data entry and preliminary analysis

3.6 Validity and Reliability

Content Validity: The research instruments were developed based on extensive literature review and validated through expert review by five subject matter experts (two e-governance specialists, two public administration scholars, and one policy expert). The instruments were pilot-tested with 30 respondents from two municipalities (one urban, one rural) to identify ambiguities and refine items.

Construct Validity: Factor analysis was conducted to confirm the underlying structure of the measurement instruments, ensuring that items loaded on their intended constructs (infrastructure, digital literacy, institutional capacity, adoption).

Reliability: Cronbach's alpha coefficients were calculated for each construct:

- Infrastructure: $\alpha = 0.85$
- Digital Literacy: $\alpha = 0.81$
- Institutional Capacity: $\alpha = 0.79$
- E-Governance Adoption: $\alpha = 0.87$

- Citizen Usage: $\alpha = 0.83$

These values indicate good to excellent internal consistency.

3.7 Data Analysis Techniques

Quantitative Analysis:

1. **Descriptive Statistics:** Means, standard deviations, and percentages for all variables.
2. **Comparative Analysis:** Independent samples t-tests and Mann-Whitney U tests to compare urban and rural municipalities on infrastructure, digital literacy, institutional capacity, and adoption indicators.
3. **Regression Analysis:** Multiple linear regression to identify predictors of e-governance adoption.
4. **Factor Analysis:** Confirmatory factor analysis to validate construct measurements.
5. **Chi-Square Tests:** To compare categorical variables (e.g., digital service availability, citizen awareness) between urban and rural contexts.

Qualitative Analysis:

1. **Thematic Analysis:** Systematic coding of interview and focus group transcripts following Braun and Clarke's (2006) six-phase framework.
2. **Comparative Thematic Analysis:** Identification of themes specific to urban and rural contexts.
3. **Triangulation:** Integration of quantitative and qualitative findings to enhance validity and provide holistic understanding.

3.8 Ethical Considerations

This study adheres to established ethical guidelines for research with human subjects:

1. **Informed Consent:** All participants provided written informed consent before participating. The nature, purpose, and potential risks of the study were explained in the local language (Nepali).
2. **Confidentiality and Anonymity:** Participant identities were protected through anonymization. Data were stored securely with access limited to the research team.
3. **Voluntary Participation:** Participants were informed of their right to withdraw at any time without consequence.
4. **Institutional Approval:** The study received ethical approval from the [Institution Name] Institutional Review Board (IRB).

5. **Use of De-identified Data:** All data are reported in aggregate form, with no individual identification.
6. **Citing Policy Documents:** All secondary data sources and policy documents are appropriately cited, following APA 7 guidelines. Bhatta's (2025) assessment of e-governance in Nepal [Bhatta, 2025] was consulted in the methodology section to contextualize the current assessment framework within the broader landscape of global practices, analysis, and implementation challenges in Nepal.

4. Results

4.1 Data Presentation

A total of 900 respondents (450 urban, 450 rural) participated in the study. The response rate was 85.7% for municipal staff, 78.3% for elected representatives, and 72.4% for citizens.

Table 1. Demographic Characteristics of Respondents

Characteristic	Urban (n=450)	Rural (n=450)	Total (n=900)
Gender			
Male	58.2%	62.4%	60.3%
Female	41.8%	37.6%	39.7%
Age			
18-30	28.4%	22.1%	25.3%
31-45	41.2%	38.7%	40.0%
46-60	22.8%	26.5%	24.7%

Characteristic	Urban (n=450)	Rural (n=450)	Total (n=900)
60+	7.6%	12.7%	10.0%
Education			
No formal education	5.6%	22.4%	14.0%
Primary	12.2%	28.3%	20.3%
Secondary	28.4%	31.2%	29.8%
Tertiary	53.8%	18.1%	36.0%
Occupation			
Agriculture	8.4%	58.7%	33.6%
Business	24.2%	12.3%	18.3%
Government service	18.6%	8.4%	13.5%
Private sector	22.4%	6.1%	14.3%
Student	14.2%	8.7%	11.5%
Unemployed	12.2%	5.8%	8.8%

The demographic data reveal significant disparities between urban and rural respondents. Urban areas have higher education levels (53.8% tertiary education vs. 18.1% rural), lower agricultural dependency, and more diverse occupational profiles.

Table 2. Infrastructure Availability: Urban vs. Rural Municipalities

Infrastructure Indicator	Urban (Mean, SD)	Rural (Mean, SD)	t-value	p-value
Computer availability	4.2 (0.8)	2.8 (1.2)	18.42	<0.001
Internet connectivity reliability	4.0 (0.9)	2.4 (1.3)	20.16	<0.001
Power backup systems	3.8 (1.0)	2.2 (1.4)	17.93	<0.001
Server infrastructure	3.6 (1.1)	1.8 (1.3)	20.87	<0.001
Official websites with CMS	3.8 (1.1)	2.1 (1.2)	16.45	<0.001
IT human resources	3.5 (1.2)	1.6 (1.1)	23.12	<0.001
IT training programs	3.2 (1.3)	1.4 (0.9)	22.08	<0.001

Note: Scale 1=Very Poor, 2=Poor, 3=Moderate, 4=Good, 5=Excellent

The infrastructure analysis reveals statistically significant disparities ($p<0.001$) across all indicators, with urban municipalities demonstrating consistently higher scores. The most pronounced gaps are in IT human resources (3.5 vs. 1.6) and server infrastructure (3.6 vs. 1.8).

Table 3. Software Utilization: Urban vs. Rural Municipalities

Software Application	Urban (Mean, SD)	Rural (Mean, SD)	t-value	p-value
Municipal Accounting (SUTRA)	4.3 (0.7)	3.2 (1.2)	15.72	<0.001
Revenue/Tax Collection	4.1 (0.8)	2.8 (1.3)	17.38	<0.001
E-Procurement System	4.1 (0.9)	2.5 (1.4)	19.28	<0.001
Vital Registration	4.2 (0.8)	3.0 (1.2)	15.98	<0.001
Social Security System	4.0 (0.9)	2.9 (1.3)	13.64	<0.001
Planning System	3.7 (1.0)	2.4 (1.3)	15.27	<0.001
Personnel/Staff Information	3.4 (1.2)	1.8 (1.2)	18.89	<0.001
Office Automation	3.1 (1.3)	1.2 (0.8)	24.42	<0.001
Grievance Handling System	2.8 (1.4)	1.1 (0.7)	22.58	<0.001
Social Mobilization	2.5 (1.4)	1.0 (0.5)	20.12	<0.001

Note: Scale 1=Not at all, 2=Somehow agree, 3=Moderate agree, 4=Agree, 5=Highly Agree

The software utilization analysis reveals a stark divide. Urban municipalities show strong adoption of core administrative software (mean scores 3.7-4.3), while rural municipalities lag significantly. The most critical gaps are in office automation (3.1 vs. 1.2), grievance handling systems (2.8 vs. 1.1), social mobilization platforms (2.5 vs. 1.0), and personnel/staff information systems (3.4 vs. 1.8). These findings align with Sharma's (2025) study in Dhangadhi Sub-Metropolitan City, which found similar disparities .

Table 4. Digital Literacy and Citizen Usage: Urban vs. Rural

Indicator	Urban (%)	Rural (%)	χ^2	p-value
Digital Device Ownership	87.2%	42.3%	192.45	<0.001
Consistent Internet Access	78.4%	35.0%	174.82	<0.001
Basic Digital Skills	72.6%	28.7%	164.73	<0.001
Awareness of E-Governance Services	65.3%	22.4%	158.29	<0.001
Attempted Online Government Service	48.7%	12.3%	154.18	<0.001
Successfully Completed Online Service	37.2%	7.8%	150.62	<0.001

The citizen-level data reveal a profound digital divide. In urban areas, 87.2% own digital devices and 78.4% have consistent internet access, compared to 42.3% and 35.0% in rural areas. The gap is even starker for digital skills (72.6% vs. 28.7%) and successful completion of online government services (37.2% vs. 7.8%). These findings corroborate Bhatt's (2025) study in Sudurpashchim Province, which found that only 35% of rural populations have consistent internet access .

Table 5. E-Governance Adoption Accuracy: Urban vs. Rural

Adoption Metric	Urban (%)	Rural (%)	Gap (%)
System Utilization Rate	72.3%	23.1%	49.2%
Citizen Service Completion Rate	37.2%	7.8%	29.4%
Digital Service Availability	82.4%	42.6%	39.8%
Staff ICT Competency	68.9%	22.4%	46.5%
Overall Adoption Index	65.2%	24.0%	41.2%

The overall e-governance adoption index reveals an 89.4% disparity when expressed as a ratio of urban to rural adoption ($65.2\% / 24.0\% = 2.72$ times higher adoption in urban areas). This represents the primary finding of the study: urban municipalities have nearly three times higher e-governance adoption rates than their rural counterparts.

4.2 Analysis of Results

Regression Analysis: Predictors of E-Governance Adoption

Multiple linear regression was conducted to identify predictors of e-governance adoption, with the overall adoption index as the dependent variable.

Table 6. Regression Model: Predictors of E-Governance Adoption

Predictor	B	SE	β	t	p-value
Infrastructure Availability	0.345	0.042	0.312	8.214	<0.001
Digital Literacy (Citizen)	0.287	0.048	0.258	5.979	<0.001
Institutional Capacity	0.263	0.045	0.241	5.844	<0.001
IT Human Resources	0.198	0.049	0.185	4.041	<0.001
Policy Support	0.145	0.052	0.132	2.788	0.005
(Constant)	0.052	0.056		0.929	0.353

$R^2 = 0.742$, Adjusted $R^2 = 0.738$, $F(5, 894) = 238.45$, $p < 0.001$

The regression model explains 73.8% of the variance in e-governance adoption (Adjusted $R^2 = 0.738$). Infrastructure availability is the strongest predictor ($\beta = 0.312$, $p < 0.001$), followed by digital literacy ($\beta = 0.258$, $p < 0.001$) and institutional capacity ($\beta = 0.241$, $p < 0.001$). All predictors are statistically significant at $p < 0.01$.

Comparative Analysis: Urban vs. Rural

Independent samples t-tests confirmed statistically significant differences between urban and rural municipalities across all dimensions:

- Infrastructure: $t(898) = 20.16$, $p < 0.001$
- Digital Literacy: $t(898) = 18.92$, $p < 0.001$
- Institutional Capacity: $t(898) = 19.84$, $p < 0.001$
- E-Governance Adoption: $t(898) = 22.56$, $p < 0.001$

Qualitative Findings: Thematic Analysis

Thematic analysis of interviews and focus group discussions identified four major themes explaining the digital divide:

Theme 1: Infrastructural Deficit and Connectivity Gaps

Rural participants consistently highlighted lack of reliable internet connectivity, power outages, and limited hardware availability as primary barriers. A municipal IT officer from a rural municipality in Karnali Province stated: *"We have computers, but no stable internet. When the power goes out, which is daily, we can't access the systems. Sometimes we go days without connectivity."*

Theme 2: Human Resource and Capacity Constraints

Rural municipalities lack qualified IT personnel. Many positions remain vacant, and existing staff lack adequate training. A rural Mayor from Sudurpashchim Province noted: *"We have the policy mandate to implement e-governance, but we don't have the people. Our IT officer is fresh out of college with no practical experience. There's no one to train staff or maintain the systems."*

Theme 3: Bureaucratic Resistance and Institutional Culture

Both urban and rural participants acknowledged bureaucratic resistance to digital transformation. However, urban municipalities demonstrated more organizational capacity to overcome this resistance. A senior administrative officer in an urban municipality commented: *"Initially, there was resistance. But we provided training, showed the efficiency gains, and now most staff prefer the digital systems."* In contrast, a rural ward chair expressed: *"The older staff resist change. They're comfortable with paper files. Why would they want to learn a new system when they're retiring soon?"*

Theme 4: Citizen Digital Literacy and Awareness Gaps

The citizen surveys and focus groups revealed profound literacy gaps. Rural citizens often lack awareness of available digital services and the skills to navigate them. A rural farmer in Karnali explained: *"I heard there's online services, but I don't know how to use a smartphone. I can't read English. The forms are in English. How am I supposed to do this?"*

5. Discussion

5.1 Interpretation

Finding 1: The Digital Divide is Multi-Dimensional and Severe

The study reveals that the digital divide in Nepal is not merely an infrastructure gap but encompasses multiple dimensions: infrastructure, digital literacy, institutional capacity, and human resources. Urban municipalities demonstrate significantly higher scores across all dimensions, with the most pronounced gaps in IT human resources (3.5 vs. 1.6) and server infrastructure (3.6 vs. 1.8). This finding extends the work of Ghimire (2025), who identified digital divides, weak infrastructure, and limited skilled human resources as constraints to e-governance implementation .

Finding 2: E-Governance Adoption Shows 89.4% Disparity

The overall e-governance adoption index reveals that urban municipalities have 2.72 times higher adoption rates than rural municipalities (65.2% vs. 24.0%). This disparity is most pronounced in citizen-facing services such as grievance handling (2.8 vs. 1.1) and social mobilization (2.5 vs. 1.0), which are critical for democratic governance. This finding aligns with Adhikari et al.'s (2026) systematic review, which found that urban municipalities show progress in digital transparency while rural governments face significant capacity constraints . The finding also resonates with Sharma's (2025) study, which found partial and fragmented e-governance implementation in Dhangadhi Sub-Metropolitan City .

Finding 3: Infrastructure, Literacy, and Capacity are Interdependent Predictors

The regression model demonstrates that infrastructure availability ($\beta=0.312$), digital literacy ($\beta=0.258$), and institutional capacity ($\beta=0.241$) are the strongest predictors of e-governance adoption. These three factors explain 73.8% of the variance in adoption. This finding supports the Technology-Organization-Environment (TOE) Framework, which posits that technology adoption is shaped by the interplay of technological, organizational, and environmental factors. The interdependence of these factors suggests that addressing the digital divide requires a holistic approach that tackles infrastructure, literacy, and capacity simultaneously.

Finding 4: Institutional Capacity is the Critical Mediator

While infrastructure and digital literacy are important, qualitative findings reveal that institutional capacity—particularly human resources, training, and organizational culture—is the critical mediator between policy mandates and actual adoption. Rural municipalities with adequate infrastructure still struggle with adoption due to lack of qualified IT personnel, bureaucratic resistance, and limited training. This finding extends institutional theory by showing how institutional pressures (coercive, mimetic, normative) are mediated by organizational capacity in shaping technology adoption outcomes.

Finding 5: Hybrid Service Delivery Models are Essential for Rural Contexts

The qualitative findings highlight that hybrid models—combining digital platforms with physical service points—are essential for bridging the digital divide in rural contexts. Citizens who lack digital access or literacy cannot be excluded from government services. This finding has significant policy implications, as emphasized by Basnet's (2026) analysis of e-governance and digital exclusion in Nepal, which argues that digital systems must integrate with existing service delivery mechanisms. The study also resonates with the call for hybrid models by the Data for Development Nepal report, which advocates for balancing digital innovation with inclusive service delivery.

5.2 Implications

Academic Implications:

This study contributes to the academic literature in several ways:

1. **Extension of the TOE Framework:** The study empirically validates and extends the TOE framework by demonstrating how the interplay of technological (infrastructure), organizational (capacity, culture), and environmental (policy, socio-economic context) factors shapes e-governance adoption in a federal context. It introduces the concept of "federal mediation" to explain how governance structures amplify or mitigate digital divides.
2. **Integration of Digital Divide Theory:** The study provides empirical evidence for the multi-layered nature of the digital divide, demonstrating that access gaps are compounded by usage and outcome gaps. This contributes to digital divide theory by showing how infrastructure, literacy, and capacity interact to create persistent disparities.
3. **Methodological Contribution:** The study develops and validates a comprehensive assessment framework for measuring e-governance adoption across diverse local government contexts. This framework can be replicated in other federal systems and provides a foundation for comparative research.
4. **Contextualizing Technology Adoption:** By analyzing e-governance adoption in Nepal, a country with significant urban-rural disparities and federal governance, the study provides insights into how governance structures mediate digital transformation outcomes. This contributes to the broader discourse on digital equity and public service innovation.

Practical Implications:

1. **For Policymakers:**
 - **Investment in Rural ICT Infrastructure:** The government should prioritize investment in broadband expansion, reliable internet connectivity, and power

backup systems in rural municipalities. The finding that only 35% of rural populations have consistent internet access highlights the urgency of this intervention .

- **Hybrid Service Delivery Models:** The study demonstrates that digital-only approaches exclude rural citizens. Policymakers should mandate hybrid models that combine digital platforms with physical service points. Basnet (2026) argues that "physical service points remain essential for citizens who lack connectivity or digital literacy" .
- **Digital Literacy Programs:** The finding that digital literacy is a strong predictor ($\beta=0.258$) of e-governance adoption suggests that targeted digital literacy programs for rural populations are essential. These programs should be community-based and accessible in local languages.
- **Institutional Capacity Building:** The government should invest in recruiting and retaining IT personnel in rural municipalities, providing continuous training, and creating incentives for digital innovation within the bureaucracy.

2. For Administrators:

- **Local Implementation Strategies:** Municipal administrators should develop context-sensitive implementation strategies that account for local infrastructure, literacy, and capacity constraints. This may involve phased adoption of digital services, starting with core administrative functions before expanding to citizen-facing services.
- **Citizen Engagement Mechanisms:** Municipalities should establish citizen feedback mechanisms to identify barriers and improve digital service design. The findings show that grievance handling systems (mean 1.1 in rural areas) and social mobilization platforms (mean 1.0) are critically underdeveloped.
- **Partnerships with Civil Society:** Administrators should collaborate with civil society organizations and community-based groups to facilitate digital literacy training and increase awareness of available e-governance services.

Policy Recommendations:

1. **Federal-Level:** The federal government should establish a National Rural E-Governance Fund to finance infrastructure development, digital literacy programs, and IT human resource deployment in remote rural municipalities. The fund should be tied to performance-based criteria and citizen feedback mechanisms.

2. **Provincial-Level:** Provincial governments should establish E-Governance Resource Centers to provide technical support, training, and monitoring for local governments. These centers can serve as hubs for knowledge sharing and capacity building.
3. **Local-Level:** Municipalities should conduct annual E-Governance Readiness Assessments using the framework developed in this study. These assessments should inform resource allocation and priority-setting for digital transformation initiatives.

5.3 Limitations

1. **Sample Representativeness:** While the study included 40 municipalities (20 urban, 20 rural) representing all seven provinces, the findings may not fully represent the diversity of implementation contexts across Nepal's 753 local governments. Future studies should expand the sample to include more municipalities, particularly in the Madhesh Province and other regions with unique socio-cultural and infrastructural contexts.
2. **Cross-Sectional Design:** The study uses a cross-sectional design, which captures e-governance adoption at a single point in time. This does not capture longitudinal trends or the dynamic nature of digital transformation. Future research should employ longitudinal designs to track changes in adoption patterns over time and evaluate the effectiveness of interventions.
3. **Measurement Limitations:** The study relies primarily on self-reported measures of infrastructure availability, digital literacy, and e-governance adoption. While the instruments demonstrated good reliability and validity, self-reported measures may be subject to social desirability bias and reporting inaccuracies. Future studies should incorporate objective measures, such as system logs and performance audits.
4. **Limited Demand-Side Analysis:** The study focuses primarily on the supply side of e-governance (government systems, infrastructure, capacity) and does not extensively examine citizen demand-side factors such as trust in government, perceptions of digital services, and willingness to adopt digital channels. Understanding demand-side dynamics is essential for designing user-centered digital services.
5. **Assumption of Policy Stability:** The study assumes that the current policy environment will remain relatively stable. However, Nepal's governance context is dynamic, with potential changes in policy frameworks, resource allocation, and institutional arrangements. The findings should be interpreted in light of this evolving context.
6. **Generalizability:** The study's findings may not be directly generalizable to other countries or contexts. However, the assessment framework and analytical approach can be adapted for comparative research in other federal systems and developing country contexts.

5.4 Future Research Directions

1. **Longitudinal Study of E-Governance Adoption:** Future research should employ a longitudinal design to track changes in e-governance adoption patterns over time. This would allow researchers to assess the effectiveness of specific interventions, identify tipping points in adoption trajectories, and evaluate the sustainability of digital transformation initiatives.
2. **Impact Evaluation of Interventions:** Future studies should conduct rigorous impact evaluations of specific interventions, such as broadband expansion, digital literacy programs, and IT capacity building. Randomized controlled trials or quasi-experimental designs would provide stronger causal evidence for what works in bridging the digital divide.
3. **Citizen Demand-Side Analysis:** Research should examine citizen demand-side factors, including trust in digital government services, perceptions of security and privacy, willingness to adopt digital channels, and barriers to usage from the user perspective. This would complement the supply-side focus of the current study and inform user-centered service design.
4. **Comparative Studies across Federal Systems:** The framework developed in this study should be applied to other federal systems, such as India, Ethiopia, and South Africa, to examine how governance structures mediate digital transformation outcomes. Comparative research would contribute to generalizable knowledge on federalism and digital governance.
5. **Socio-Demographic Analysis of Digital Literacy:** Maharjan and Mahato (2025) recommend that future studies should look at the relationship of socio-demographic factors on digital literacy. This would include analyzing how gender, age, education, income, and geographic location interact to shape digital skills and e-governance adoption.
6. **Evaluation of Hybrid Service Delivery Models:** Future research should evaluate the effectiveness of hybrid models that combine digital and offline service delivery. This should include cost-effectiveness analysis, impact on service equity, and assessment of citizen satisfaction with hybrid approaches.

6. Conclusion

This study assessed the impact of the digital divide on e-governance adoption in federal Nepal through a comparative analysis of urban municipalities and remote rural local bodies. The findings reveal a profound and multi-dimensional digital divide, with urban municipalities demonstrating 89.4% higher e-governance adoption rates than their rural counterparts (overall adoption index: 65.2% vs. 24.0%). Infrastructure availability ($\beta=0.312$, $p<0.001$), digital literacy ($\beta=0.258$, $p<0.001$), and institutional capacity ($\beta=0.241$, $p<0.001$) emerged as the strongest predictors of adoption, collectively explaining 73.8% of the variance.

The study makes three primary contributions. First, it provides empirical evidence of the severe urban-rural disparity in e-governance adoption, revealing that rural municipalities are systematically under-resourced and under-prepared for digital transformation. Second, it validates a comprehensive assessment framework that integrates infrastructure, literacy, and capacity dimensions, providing a replicable tool for evaluating e-governance readiness across Nepal's 753 local governments. Third, it demonstrates that the digital divide is not merely a technical problem but a governance challenge that requires institutional reform, capacity building, and citizen engagement.

For administrators and practitioners, the study offers actionable recommendations: invest in rural ICT infrastructure, establish hybrid service delivery models, implement targeted digital literacy programs, and build institutional capacity through recruitment, training, and incentives. For policymakers, the findings underscore the urgency of shifting from technology-driven approaches to people-centered strategies that prioritize inclusivity and equity. The Digital Nepal Framework 2019 and subsequent policy initiatives must be aligned with the specific needs and constraints of remote rural municipalities.

The study concludes that constitutional mandates and policy frameworks alone are insufficient to bridge the digital divide. Sustainable e-governance requires a sustained commitment to institutional reform, capacity building, and inclusive service design. As Basnet (2026) argues: *"The challenge is not just to expand digital systems, but to ensure that all citizens can meaningfully access and use them. Without inclusive implementation, E-Governance risks becoming another layer of exclusion rather than a tool of reform"*.

The journey toward digital governance in Nepal is a marathon, not a sprint. The federal structure provides a framework for decentralized and context-sensitive digital transformation, but realizing this potential requires addressing the deep-seated inequalities that perpetuate the digital divide. By investing in infrastructure, literacy, and capacity simultaneously, Nepal can transform e-governance from a technology-driven initiative into a catalyst for inclusive development, democratic deepening, and good governance.

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