

Digital Inclusion and Citizen Adoption of E-Services in Nepal: An Empirical Assessment using TAM and UTAUT

Dr. Shreedhar Marasini¹, Dr. Abhijit Gupta²

Young Minds Creation, Research and Development Department

Abstract— Digital government has improved the availability of public services in many developing countries, yet citizen adoption of electronic services remains limited. In Nepal, increasing internet access and smartphone ownership have not resulted in proportional use of digital public services, particularly among rural and disadvantaged communities. This study examines the factors influencing citizen adoption of e-services by focusing on digital inclusion and digital literacy. Drawing on the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), the study investigates how perceived usefulness, perceived ease of use, social influence, facilitating conditions, and digital skills affect citizens' willingness to use e-government services. A quantitative research design using a structured citizen survey is proposed, supported by descriptive statistics and structural relationship analysis. The study builds upon the author's earlier work on e-readiness, information system governance, cybersecurity, and provincial digital governance to extend digital inclusion research within Nepal's federal context. It proposes a conceptual framework that links digital literacy with citizen adoption of e-services. The findings are expected to provide evidence-based recommendations for improving digital inclusion, reducing the digital divide, and strengthening citizen-centered digital governance. The study contributes to digital divide theory by offering empirical insights from a developing federal country and proposes practical strategies for increasing the adoption of digital public services.

Keywords— Digital Inclusion; E-Government Adoption; Digital Literacy; Technology Acceptance Model (TAM); Unified Theory of Acceptance and Use of Technology (UTAUT); Digital Divide; Nepal

I. INTRODUCTION

Digital technologies have transformed public administration by improving the efficiency, transparency, and accessibility of government services. Governments around the world increasingly use digital platforms to provide information, deliver services, collect revenue, and strengthen citizen participation. These initiatives have become central to achieving good governance and sustainable development [1]. While many countries have expanded online public services, the availability of digital platforms alone does not guarantee that citizens will use them effectively.

Digital inclusion has emerged as a critical factor in determining the success of e-governance initiatives. Digital inclusion refers to equitable access to digital technologies, affordable internet connectivity, digital literacy, accessible online services, and the ability of citizens to participate fully in the digital society. Citizens who lack digital skills or access to technology often remain excluded from the benefits of digital government, creating a persistent digital divide [2]. Consequently, governments must focus not only on building digital infrastructure but also on ensuring that citizens possess the skills and confidence required to use electronic public services.

Nepal has made significant progress in expanding digital infrastructure over the last decade. National initiatives such as the Digital Nepal Framework, the National Information and Communication Technology Policy, and various e-government programs have improved internet connectivity and online public services. The United Nations E-Government Survey 2024 also indicates continued improvement in Nepal's E-Government Development Index (EGDI), reflecting advances in online services, telecommunications infrastructure, and human capital [1]. Despite these improvements, citizen adoption of digital public services remains relatively low, particularly in rural areas, among elderly citizens, and within socially and economically disadvantaged communities.

Previous studies conducted in Nepal have primarily focused on institutional readiness, ICT infrastructure, and information system governance. Gupta, Marasini, and Shakya demonstrated that organizational readiness, ICT infrastructure, and leadership commitment significantly influence the implementation of e-government initiatives [3]. Similarly, Marasini and Shakya emphasized the importance of human resource readiness and ICT infrastructure in supporting digital transformation within government institutions [4]. Gupta and Shakya further highlighted that information system auditing, cybersecurity, and governance mechanisms are essential for building trust in digital government systems [5] [4] [6]. More recent studies have extended this work to provincial digital governance and institutional maturity in Nepal's federal system [7] [8].

However, limited research has examined digital inclusion from the citizens' perspective and investigated the factors influencing their adoption of e-government services.

To address this gap, the present study applies the Technology Acceptance Model (TAM) [9] and the Unified Theory of Acceptance and Use of Technology (UTAUT) [10] to examine citizen adoption of digital public services in Nepal. TAM explains technology adoption through perceived usefulness and perceived ease of use, whereas UTAUT incorporates additional factors such as social influence and facilitating conditions. Integrating these models provides a comprehensive framework for understanding how digital literacy, accessibility, and institutional support shape citizens' willingness to use e-services.

The objectives of this study are threefold: (1) to identify the major barriers affecting citizens' adoption of e-government services in Nepal; (2) to examine the influence of digital literacy and technology acceptance factors on citizens' behavioral intention to use digital public services; and (3) to propose policy recommendations that promote digital inclusion and reduce the digital divide. By extending previous research on institutional readiness toward citizen readiness, this study contributes to digital inclusion theory and offers practical guidance for designing more inclusive and accessible digital government services in Nepal and other developing countries.

II. LITERATURE REVIEW

A. Digital Inclusion and E-Governance

Digital inclusion has become a fundamental requirement for successful digital government. It refers to the ability of all citizens to access digital technologies, possess adequate digital skills, and use online services regardless of age, gender, education, income, or geographic location [2]. Governments increasingly recognize that expanding digital infrastructure alone does not guarantee equitable access to public services. Citizens also require affordable internet connectivity, appropriate devices, digital literacy, and confidence in using technology [11].

The United Nations has identified digital inclusion as a key pillar of sustainable digital transformation and public service modernization. The United Nations E-Government Survey 2024 emphasizes that governments should develop citizen-centric services while reducing inequalities in digital access and capability [1]. Similarly, the World Bank argues that digital inclusion contributes to economic development, social participation, and improved public service delivery, particularly in developing countries [12].

Developing countries continue to experience substantial disparities in digital access. Rural communities often face poor connectivity, inadequate ICT infrastructure, and limited digital literacy, resulting in unequal adoption of digital public services [13]. Heeks (2006) described this challenge as one of the principal barriers to e-government implementation, emphasizing that organizational and social readiness are as important as technological investment [14]. More recently, Di Giulio and Vecchi (2021) argued that successful digital transformation requires governments to invest simultaneously in institutional reform, citizen capacity building, and digital innovation [15].

In Nepal, digital inclusion has become increasingly important following the implementation of federal governance. Provincial and local governments are expected to deliver digital services, yet variations in infrastructure, institutional capacity, and citizens' digital skills continue to limit service adoption. Although internet penetration has increased considerably during the past decade, the effective use of e-services remains relatively low, particularly among rural populations and marginalized communities.

B. Digital Readiness in Nepal

Digital readiness describes the preparedness of institutions and citizens to adopt digital technologies effectively. It includes ICT infrastructure, leadership, organizational commitment, policy support, financial resources, digital skills, and institutional capacity [14]. Digital readiness is therefore considered a prerequisite for successful digital transformation.

Among the earliest studies on digital readiness in Nepal, Gupta, Marasini, and Shakya assessed the e-readiness of Nepalese ministries and found considerable variation in ICT infrastructure, leadership commitment, policy implementation, and organizational capacity [3]. Their research concluded that institutional readiness significantly influences successful e-government implementation. Likewise, Marasini and Shakya examined e-readiness in the human resource domain and reported that limited ICT skills, inadequate organizational commitment, and insufficient capacity development reduced institutional preparedness for digital government [16]. Another study by Marasini and Shakya focused on ICT infrastructure and concluded that uneven technological capacity remained one of the principal barriers to digital transformation within government agencies [17].

These studies collectively demonstrate that digital transformation depends not only on technology but also on organizational readiness, leadership commitment, and human resource development.

However, most previous studies focused on institutional readiness rather than citizens' readiness to adopt digital services. The present study extends this literature by examining digital readiness from the perspective of service users.

C. Technology Acceptance and Citizen Adoption

While digital infrastructure creates opportunities for online public services, citizens ultimately determine the success of e-government through their willingness to adopt these services. The Technology Acceptance Model (TAM) proposed by Davis remains one of the most influential frameworks for explaining technology adoption [9]. TAM argues that two factors primarily determine technology acceptance: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Users are more likely to adopt digital services when they believe that technology improves performance and is easy to operate.

Recognizing the limitations of TAM, Venkatesh et al. introduced the Unified Theory of Acceptance and Use of Technology (UTAUT) [10]. UTAUT expands technology acceptance by incorporating Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions as determinants of behavioral intention and actual technology use. Numerous studies have confirmed that UTAUT provides stronger explanatory power for e-government adoption than earlier models because it considers both technological and social influences [18].

In developing countries, digital literacy has emerged as an additional factor influencing technology adoption. Citizens with higher digital competence generally perceive digital services as more useful and easier to use, increasing their intention to adopt e-government services [11]. Conversely, limited digital skills, language barriers, and lack of trust in government systems reduce citizen participation in digital governance.

D. Information System Governance, Security, and Citizen Trust

Citizen trust remains one of the strongest determinants of digital service adoption. Security breaches, privacy concerns, and poor service reliability reduce public confidence and discourage citizens from using online government services.

Early research by Gupta and Shakya emphasized that information system auditing should be integrated into e-government projects to improve accountability, transparency, and operational effectiveness [4]. Their study highlighted weaknesses in governance mechanisms across Nepalese government institutions.

Expanding this work, Gupta and Shakya identified inadequate security policies, weak risk management practices, and insufficient institutional governance as major cybersecurity challenges [5]. In another study, Gupta and Shakya argued that cloud computing adoption within government requires stronger cybersecurity frameworks, systematic auditing, and effective information security governance [6].

These studies demonstrate that technical infrastructure alone cannot guarantee successful digital transformation. Secure systems, transparent governance, and effective auditing are essential for building citizen trust and encouraging widespread adoption of digital services.

E. Evolution of Digital Governance Research

Digital governance research has gradually evolved from technology implementation toward strategic governance and national resilience. Recent studies recognize digital technologies as strategic assets that influence economic development, institutional performance, and international cooperation.

Gupta proposed that technology, governance, and security should be viewed as interconnected components of modern digital states [4]. More recently, Gupta, Maharjan, and Marasini assessed digital readiness and e-governance maturity in Madhesh Province and concluded that institutional coordination, interoperability, and leadership remain critical factors for provincial digital transformation [8]. Marasini and Gupta further identified institutional fragmentation, policy implementation gaps, and limited coordination between federal and provincial governments as major barriers to digital governance in Nepal [7].

These recent studies extend earlier work on e-readiness by demonstrating that governance quality significantly influences digital transformation outcomes. However, they primarily focus on institutional perspectives rather than citizens' adoption of digital services.

F. Research Gap

Although considerable research has examined e-government implementation, institutional readiness, ICT infrastructure, and information system governance in Nepal [3] [4] [5] [8] [16] [17], empirical evidence on digital inclusion and citizen adoption of e-services remains limited. Existing studies have largely emphasized organizational capacity, while comparatively little attention has been given to citizens' digital literacy, technology acceptance, and behavioral intentions. Moreover, few studies have integrated TAM and UTAUT within Nepal's federal governance context to explain e-service adoption.

This study addresses these gaps by examining how digital literacy, perceived usefulness, perceived ease of use, social influence, and facilitating conditions shape citizens' adoption of e-services in Nepal. By integrating digital inclusion theory with TAM and UTAUT and building on the author's previous research on e-readiness and digital governance, the study proposes a comprehensive framework for understanding citizen-centered digital transformation. The findings contribute to digital divide research in South Asia and provide practical evidence for designing more inclusive and accessible digital government services.

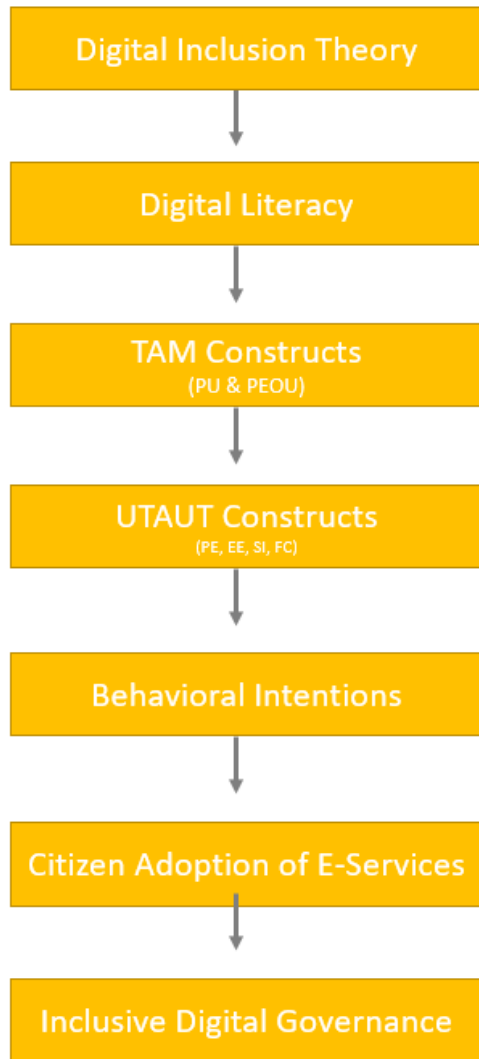


Figure 1. Conceptual Foundation of the Study

Table 4. Comparison of Technology Adoption Models

Model	Main Variables	Strengths	Limitations	Contribution of This Study
TAM (Davis, 1989)	Perceived usefulness, perceived ease of use	Simple and widely validated	Limited social and institutional factors	Extended by incorporating digital inclusion and literacy
UTAUT (Venkatesh et al., 2003)	Performance expectancy, effort expectancy, social influence, facilitating conditions	High explanatory power	Limited focus on digital divide	Combined with digital inclusion and institutional context
Digital Divide Theory	Access, skills, affordability	Explains inequalities in technology access	Does not explain behavioral intention	Integrated with TAM and UTAUT
Proposed Framework	Digital inclusion + Digital literacy + TAM + UTAUT + Institutional support	Comprehensive explanation of e-service adoption in developing countries	Requires empirical validation	Provides a citizen-centered framework for federal digital governance

III. RESEARCH METHODOLOGY

This study adopted a qualitative case study approach based on the systematic analysis of secondary data to examine digital inclusion and citizen adoption of e-services in Madhesh Province, Nepal. The primary source of evidence was the E-Governance Master Plan (EGMP) for Madhesh Province, which was developed through comprehensive institutional assessments, stakeholder consultations, field observations, focus group discussions, key informant interviews, and policy reviews. The EGMP provides detailed information on the province's digital infrastructure, ICT policies, public service delivery, institutional capacity, citizen engagement, and barriers to digital transformation.

A documentary analysis method was employed to review and synthesize the findings of the EGMP alongside relevant national policies, government reports, the United Nations E-Government Survey, and existing academic literature on digital inclusion and e-governance. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) were used as analytical frameworks to interpret the factors influencing citizen adoption of digital public services. Thematic analysis was applied to identify recurring issues related to digital literacy, accessibility, perceived usefulness, ease of use, social influence, and facilitating conditions. By integrating established technology adoption theories with evidence from the EGMP, this study provides a contextual assessment of digital inclusion and offers policy recommendations to improve citizen participation in e-government services in Nepal.

The framework proposes that digital inclusion is the foundation of successful e-government adoption. Citizens must first have access to affordable digital infrastructure and basic digital literacy before they can effectively use online government services. Once these enabling conditions are established, citizens evaluate e-services based on the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT).

Perceived usefulness, perceived ease of use, performance expectancy, effort expectancy, social influence, and facilitating conditions shape citizens' behavioral intention to use digital public services. Positive behavioral intention leads to higher adoption of e-services, which ultimately supports inclusive digital governance, improved public service delivery, and sustainable development. Unlike traditional TAM and UTAUT models, this framework explicitly positions digital inclusion and digital literacy as foundational determinants of technology adoption, making it particularly suitable for developing countries with unequal digital access.

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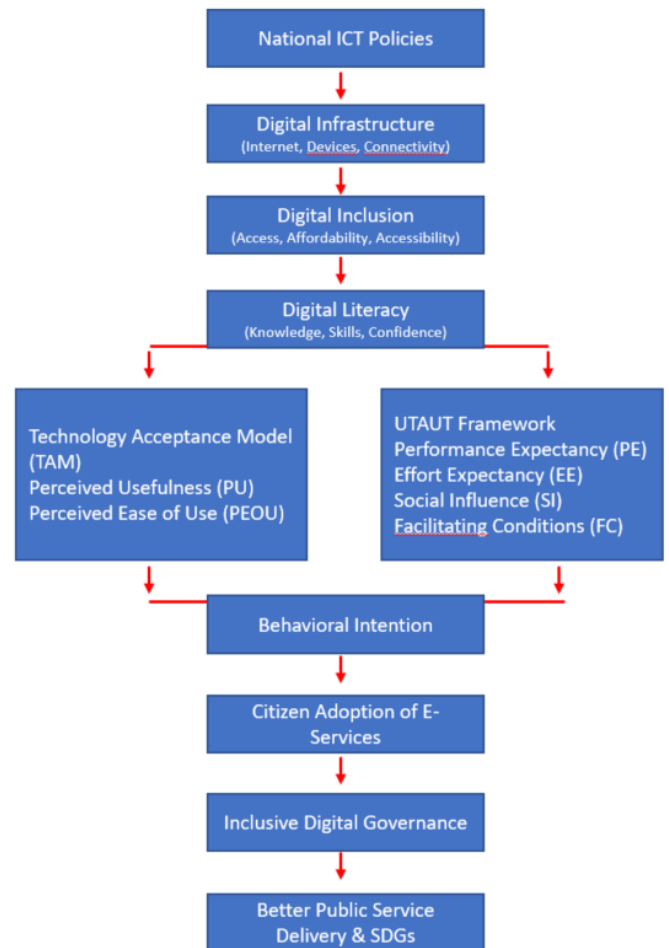


Figure 1. Proposed Digital Inclusion Framework for Citizen Adoption of E-Services

IV. ANALYSIS AND DISCUSSION

The analysis of the E-Governance Master Plan (EGMP) indicates that Madhesh Province has made important progress in establishing the institutional and technological foundations for digital government. However, the adoption of digital public services remains constrained by several socio-technical barriers that limit citizen participation.

The findings suggest that digital inclusion depends not only on the availability of ICT infrastructure but also on citizens' digital literacy, institutional capacity, service accessibility, and public trust in digital systems.

These findings demonstrate that expanding digital infrastructure alone is insufficient to achieve inclusive digital governance.

TABLE I Major Digital Inclusion challenges identified in the EGMP

Challenge	Observation	Impact on E-Service Adoption
Limited digital literacy	Many citizens lack basic ICT skills	Low adoption of online services
Unequal internet access	Rural areas experience weaker connectivity	Reduced accessibility
Low awareness	Citizens are unaware of available e-services	Limited utilization
Language and usability issues	Digital platforms are not always user-friendly	Reduced ease of use
Digital trust	Concerns about privacy and security	Lower citizen confidence

The findings indicate that digital literacy and accessibility remain the two most significant determinants of citizen adoption.

B. Technology Adoption Factors

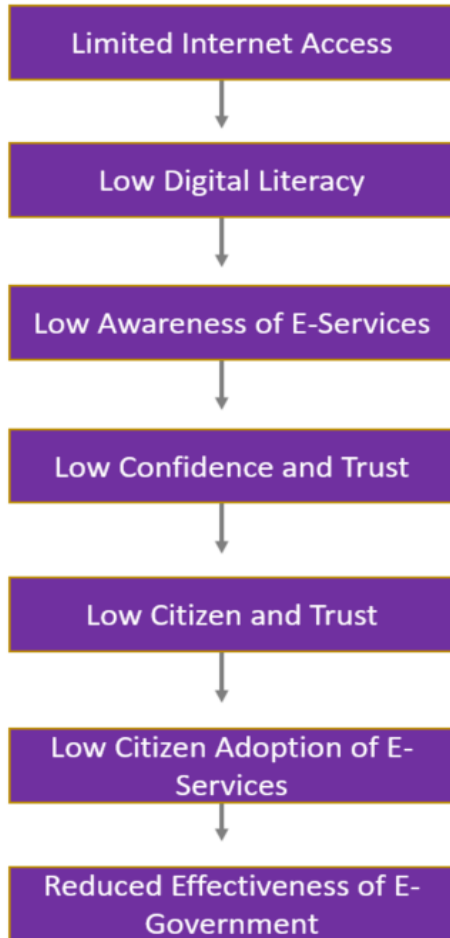


Figure 2. Digital Inclusion Barriers

A. Digital Inclusion status in Madhesh Province

The EGMP highlights significant differences in digital access across districts and communities. Urban municipalities have relatively better internet connectivity and access to digital devices than rural municipalities. Despite increasing mobile phone and internet penetration, many citizens continue to rely on traditional government offices because they lack digital skills or awareness of available online services. Older adults, low-income households, women in rural communities, and marginalized populations face greater barriers to using digital public services.

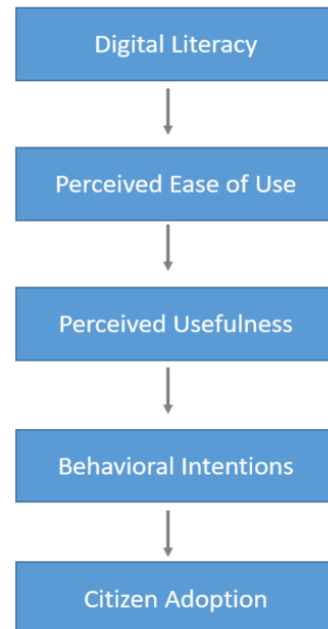


Figure 1. Factors Influencing Citizen Adoption of E-Services

The findings were interpreted using the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). The EGMP indicates that citizens are more likely to adopt e-services when digital platforms are simple to use, provide clear benefits, and are supported by adequate infrastructure. These observations are consistent with TAM, which emphasizes perceived usefulness and perceived ease of use as key determinants of technology adoption [9]. Similarly, UTAUT suggests that performance expectancy, effort expectancy, social influence, and facilitating conditions significantly influence citizens' behavioral intention to use digital services [10].

C. Institutional Barriers

The EGMP identifies several institutional challenges that affect citizen adoption. Government agencies continue to operate isolated information systems with limited interoperability. Digital services are often implemented independently, resulting in inconsistent user experiences and duplication of effort. Furthermore, limited ICT personnel, inadequate capacity-building programs, and insufficient public awareness campaigns reduce the effectiveness of digital transformation initiatives.

Table 2. Institutional Factors Affecting Citizen Adoption

Institutional Factor	Current Status	Effect
ICT Governance	Moderate	Weak coordination
Interoperability	Limited	Fragmented services
Digital Skills Training	Insufficient	Low digital literacy
Citizen Awareness	Limited	Low service utilization
Cybersecurity Governance	Developing	Trust concerns

D. Discussion

The findings demonstrate that digital inclusion is a multidimensional challenge involving technology, institutions, and citizens. While ICT infrastructure has improved considerably, institutional fragmentation and limited digital literacy continue to constrain the effective adoption of e-services. These observations are consistent with earlier studies on Nepal's institutional e-readiness [3] [4] [6], which found that organizational capacity and human resources are essential for successful digital transformation.

The study also reinforces the importance of information system governance and cybersecurity in building public trust. Gupta and Shakya argued that secure and well-governed information systems are prerequisites for sustainable e-government implementation [5] [4] [6]. The EGMP findings suggest that strengthening cybersecurity policies, improving interoperability, and increasing public awareness can significantly enhance citizens' willingness to use digital services.

From a theoretical perspective, the results support both TAM and UTAUT by demonstrating that digital literacy influences perceived ease of use, perceived usefulness, and behavioral intention. However, the study further suggests that institutional readiness and digital inclusion should be considered complementary determinants of e-government adoption in developing countries. This extends existing technology adoption models by incorporating governance and digital equity dimensions, providing a more comprehensive explanation of citizen adoption in federal and resource-constrained contexts.

V. POLICY RECOMMENDATIONS

The findings indicate that improving digital infrastructure alone is insufficient to increase citizen adoption of e-government services. A comprehensive approach that combines institutional reform, digital literacy, accessible service design, and public awareness is required.

First, the Government of Nepal and provincial governments should implement comprehensive digital literacy programs, particularly targeting rural communities, women, senior citizens, persons with disabilities, and other digitally excluded groups. Community-based ICT training through schools, municipalities, and public service centers can improve citizens' confidence and ability to use digital public services.

Second, governments should invest in reliable digital infrastructure by expanding broadband connectivity, improving mobile network coverage, and ensuring affordable internet access in underserved areas. Equal access to digital infrastructure is essential for reducing regional disparities and promoting inclusive governance.

Third, government agencies should adopt citizen-centered service design by developing simple, multilingual, and mobile-friendly digital platforms. Online services should be designed according to universal accessibility standards so that they are easy to understand and use regardless of users' educational background or technical skills.

Fourth, public trust should be strengthened through robust cybersecurity policies, information system auditing, privacy protection, and transparent data governance.

Secure digital platforms encourage citizens to adopt online public services with greater confidence.

Finally, governments should establish continuous monitoring and evaluation mechanisms to measure digital inclusion, citizen satisfaction, and service utilization. Periodic assessments using digital inclusion indicators will support evidence-based policymaking and help identify areas requiring further improvement.

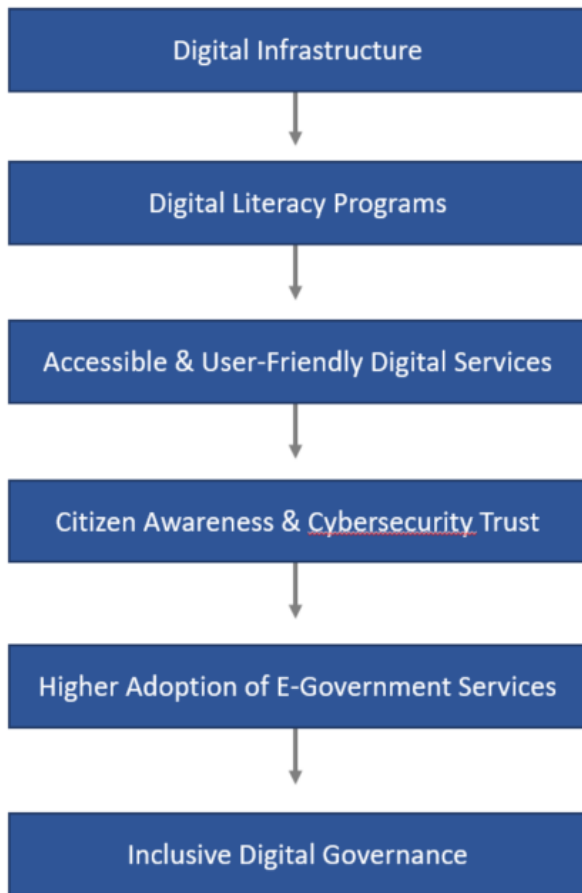


Figure 2. Framework for Improving Citizen Adoption of E-Services

Table 3. Policy Recommendations for Enhancing Digital Inclusion

Policy Area	Recommended Action	Expected Outcome
Digital Literacy	Community ICT training and awareness campaigns	Improved digital skills and citizen confidence
Digital Infrastructure	Expand broadband and mobile connectivity	Increased accessibility to e-services
Service Design	Develop multilingual and user-friendly platforms	Higher citizen adoption
Cybersecurity	Strengthen privacy, security, and auditing	Increased public trust
Institutional Coordination	Improve collaboration among federal, provincial, and local governments	Better service integration
Monitoring and Evaluation	Regular digital inclusion assessments	Evidence-based policy improvements

VI. CONCLUSION

Digital inclusion is essential for ensuring that the benefits of digital government reach all citizens. Although Nepal has made considerable progress in expanding ICT infrastructure and digital public services, significant challenges remain in achieving widespread citizen adoption. Evidence from the E-Governance Master Plan of Madhesh Province indicates that limited digital literacy, unequal access to digital technologies, low public awareness, fragmented institutional coordination, and cybersecurity concerns continue to restrict the effective use of e-government services.

By integrating Digital Inclusion Theory, TAM, and UTAUT, this study provides a comprehensive understanding of the factors influencing citizen adoption of digital public services in Nepal. Unlike earlier studies that primarily examined institutional readiness, the present research demonstrates that successful digital transformation depends equally on citizens' digital capabilities and trust in government systems. The study therefore extends previous research by linking institutional readiness with citizen readiness within a unified conceptual framework.

The findings have important policy implications for Nepal and other developing countries pursuing inclusive digital transformation. Investments in digital literacy, affordable connectivity, accessible service design, cybersecurity, and institutional coordination can substantially improve citizen participation in digital governance. Future research should validate the proposed conceptual framework using large-scale empirical surveys across multiple provinces and compare digital inclusion outcomes across different socioeconomic and geographic contexts.

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