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The impact of e-government on public services: Access, efficiency, and quality in Kathmandu metropolitan city

Prabin Thapaliya
ORCID Nr: 0009-0004-6279-3760
United Nations Institute for Training and Research, Geneva, Switzerland
prabinth13@gmail.com

Vatcharaporn Esichaikul
ORCID Nr: 0000-0003-0031-5056
Asian Institute of Technology, Bangkok, Thailand
vatchara@ait.asia

This study examines the impact of e-government services on public service delivery in Kathmandu Metropolitan City, with a focus on the Electronic Building Permit System (e-BPS). The research utilises both quantitative and qualitative methods to analyse citizens' perceptions of service access, quality, and efficiency. Results indicate that e-government initiatives have significantly enhanced service delivery, though challenges remain in user participation and system accessibility. These findings contribute to understanding e-government's role in urban governance, providing insights for policymakers and urban planners.

Keywords: E-government, Electronic Building Permit System, Kathmandu, Public services, Service delivery

1. Introduction

The rapid advancement of information and communication technologies (ICTs) has revolutionised public administration, giving rise to e-government as a transformative tool for enhancing public service delivery. In developing countries like Nepal, the adoption of e-government is seen as a means to improve transparency, efficiency, and accessibility of government services.

This study investigates the impact of e-government services on public service delivery in Kathmandu Metropolitan City, with a specific focus on the Electronic Building Permit System (e-BPS). The research explores how citizens perceive these services in terms of access, quality, and efficiency and examines the system's effectiveness in streamlining administrative processes.

1.1. Background of e-government in Nepal

Nepal's journey toward e-government reflects its commitment to using technology for better service delivery (Bajracharya, 2022). Key initiatives like the 'Digital Nepal Framework' aim to digitise internal processes and services, reducing paperwork and improving efficiency in the delivery of public services. However, the country's progress in the adoption of technology in service delivery, as measured by the E-Government Development Index, has been inconsistent, showing improvements but also highlighting areas that require further focus, such as expanding internet connectivity and addressing low digital literacy (USAID, 2022).

E-government services in Kathmandu metropolitan city

Kathmandu Metropolitan City (KMC) has embraced e-government services to improve service management. The e-BPS stands out for successfully digitising the building permit process among these services. This system has set a standard and demonstrates how digital platforms can improve public service quality and accessibility. However, challenges remain, such as the issues with the KMC Mobile App, highlighting the need for better planning and evaluation of digital solutions.

Electronic Building Permit System (e-BPS)

The e-BPS was introduced to address Kathmandu's building permit process challenges, such as document tracking inefficiencies and compliance enforcement issues (Izumi & Shaw, 2015). This system, developed in collaboration with the United Nations Development Programme, aims to implement the National Building Code (NBC) and local by-laws more effectively. The e-BPS not only streamlines the permit process but also provides a comprehensive database for assessing the seismic vulnerability of buildings, enhancing governance and public safety.

1.2. Study Objectives

1) Examine how citizens perceive E-Government Services in terms of access, quality, and efficiency, and explore their level of participation in these services.
2) Explore the effectiveness and efficiency of the e-BPS in enhancing service delivery in Kathmandu Metropolitan City.

2. Theoretical background and related works

The term "e-government" refers to the application of information technologies by government organisations to alter how they interact with their constituents, businesses, and other branches of the government (Bank, 2015a). The United Nations defines e-government as using Information and Communication Technologies (ICTs) to more effectively and efficiently deliver government services to citizens and businesses (Nations, 2023). As a transformative initiative, E-government aims to streamline public service delivery, enhance transparency, and foster closer citizen-government interactions (Grant & Chau, 2005). It seeks high-quality, seamless public services while promoting social and economic development at multiple levels.

2.1. Importance of e-government in developing countries

E-government is particularly vital in developing countries, where traditional administrative systems often struggle with inefficiencies, limited resources, and complexities (Ndou, 2004). By digitising processes, e-government offers solutions to these challenges, fostering better service delivery, reducing corruption, and bridging the gap between government and citizens (Wild, 2012). Additionally, e-government initiatives are crucial in promoting transparency and accountability, which are essential for good governance in these regions (Halachmi & Greiling, 2013). These benefits can extend to attracting foreign investment and supporting socio-economic development (Al-Sadiq, 2021).

Despite the challenges posed by infrastructure and digital literacy, many countries have embarked on ambitious e-government projects to leapfrog traditional barriers and improve service delivery (Ndou, 2004). However, issues such as the digital divide and data security concerns must be addressed to ensure the success of these initiatives (Samsor, 2020). E-government in developing nations represents a path to efficient, transparent, and responsive governance in the digital age (OECD, 2010).

2.2. Assessment of e-government services and theoretical frameworks

Assessing the effectiveness of e-government initiatives requires a multidimensional approach, with key dimensions such as access, efficiency, and quality forming the foundation. Access ensures inclusivity by enabling all citizens to interact with digital services, regardless of their background or technical abilities. Efficiency focuses on streamlining administrative processes, reducing bureaucratic complexity and costs, and improving the speed and responsiveness of public service delivery. The quality dimension is seen as critical in guaranteeing that services are reliable, secure, and meet users' expectations, thereby enhancing trust and user satisfaction.

These dimensions are better understood through the lens of established theoretical models that provide a structured framework for analysing e-government adoption and impact. Central models include the E-Government Adoption Model (E-GAM), the Technology Acceptance Model (TAM), and the Service Quality Model (SERVQUAL). Building on the broader TAM, the E-GAM emphasises factors such as ease of use and perceived usefulness, which are critical in understanding how citizens engage with e-government services (Carter & Bélanger, 2005; Davis, 1989). SERVQUAL, on the other hand, focuses on service quality dimensions like reliability, responsiveness, and assurance, which are essential for evaluating the success of digital service delivery (Parasuraman et al., 1988). These models collectively frame the research, allowing for a comprehensive evaluation of user adoption, satisfaction, and the overall impact of e-government initiatives on public services.

2.3. Related work

This research builds upon existing studies that explore e-government in terms of access, efficiency, and quality, providing an understanding the impact of digital transformation on public services.

For instance, Carter and Bélanger (2005) investigated citizen trust and innovation in e-government services, emphasising that ease of access and service quality significantly influence user adoption and satisfaction. Their findings highlight the importance of user-centric design in enhancing e-government adoption. Ndou (2004) examined the role of e-government in developing countries, identifying how digital transformation improves efficiency and transparency in public service delivery. However, Ndou also pointed out barriers like the digital divide, which can limit access to e-services in underdeveloped regions. Venkatesh et al. (2003) proposed the Unified Theory of Acceptance and Use of Technology (UTAUT), which focuses on performance expectancy and effort expectancy as critical factors driving the adoption of technology, including e-government services. This framework is central to understanding how citizens perceive and engage with digital platforms. Lastly, Parasuraman et al. (1988) introduced the SERVQUAL model, often applied to e-government to measure service quality. Their study underscores the impact of service reliability, responsiveness, and assurance on user satisfaction, an essential factor in evaluating the success of e-government initiatives.

These studies collectively provide a valuable backdrop, allowing this research to extend the understanding of e-government services, particularly in the context of Kathmandu City.

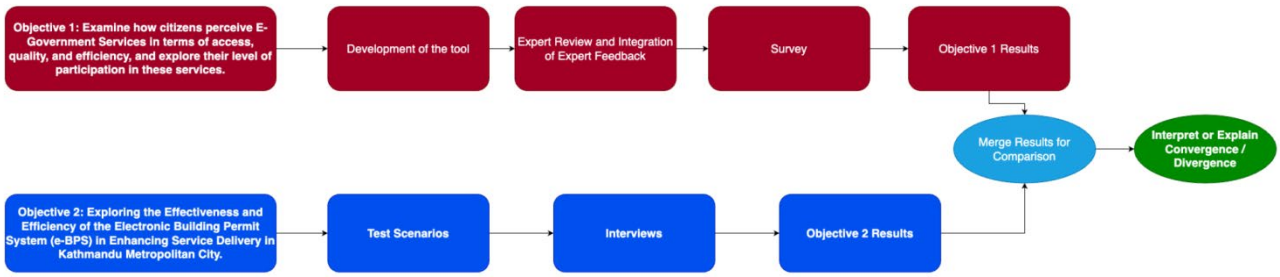
3. Methodology

This section outlines the research design and methodology employed in the study, which combines quantitative and qualitative approaches to provide a comprehensive understanding of the impact of e-government services on public service delivery in Kathmandu Metropolitan City.

3.1. Research design

The study employed a mixed-methods research design, integrating both quantitative surveys and qualitative interviews. (see Figure 1).

Figure 1: Research design



The quantitative component consisted of structured surveys administered to a broad sample of citizens within Kathmandu Metropolitan City. The surveys assess how the general population perceives e-government services in terms of access, quality, efficiency, and level of participation. The qualitative component involved in-depth interviews with key stakeholders, including government officials and users of the e-BPS, to gain deeper insights into the system's effectiveness .

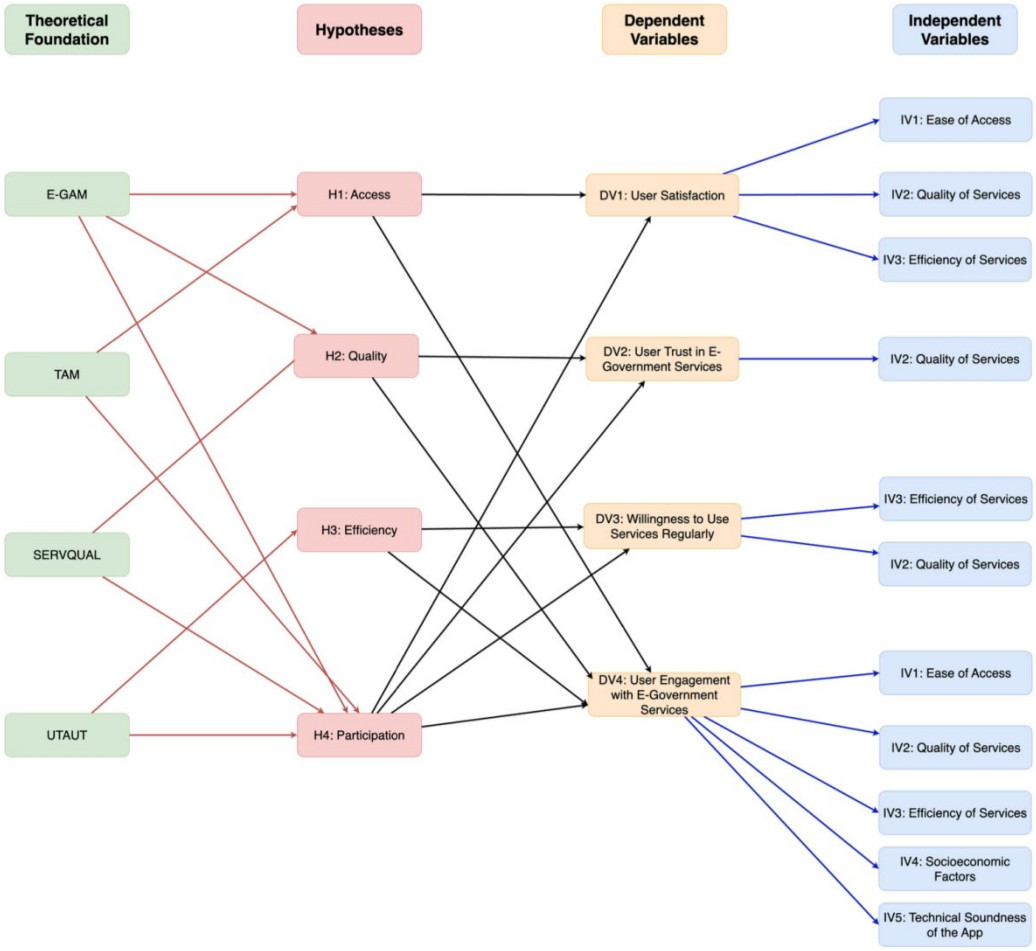
3.2. Applied framework

The research is grounded in several theoretical frameworks that guide the analysis of e-government adoption and service quality. These include the E-Government Adoption Model (E-GAM), the Technology Acceptance Model (TAM), and the Service Quality Model (SERVQUAL). These models provide a lens through which the study examines user acceptance, satisfaction, and the overall effectiveness of the e-BPS, as well as perceptions of e-government services in the broader context of public service delivery.

3.3. Proposed conceptual model

The conceptual model categorises the relationships between the variables into three main pathways: the impact of access, quality, and efficiency on user satisfaction and participation (see Figure 2).

Figure 2: Conceptual model



This study employs a conceptual model to examine the impact of e-government initiatives, specifically focusing on service accessibility, efficiency, and quality in Kathmandu Metropolitan City. The model is grounded in the E-Government Adoption Model (E-GAM), the Technology Acceptance Model (TAM), and the Service Quality Model (SERVQUAL), which guide the analysis of citizen engagement and satisfaction.

Dependent variables

Dependent Variables (DVs) include user satisfaction, user trust, willingness to use services regularly, and user engagement. User satisfaction refers to the overall contentment of citizens with the e-government services provided. It is a crucial measure as it reflects the success of these services in meeting the needs and expectations of the public. User trust is another critical dependent variable, focusing on citizens' confidence in the accuracy, reliability, and security of the e-government services. This trust is essential for the sustained use and acceptance of digital platforms. Additionally, the willingness to use services regularly gauges the citizens' intention to continue engaging with e-government services, while user engagement measures the frequency and extent of their interactions with these services.

Independent variables

The study identifies several Independent Variables (IVs) to understand the factors influencing these dependent variables. Ease of access is a significant independent variable, representing the simplicity and convenience citizens can use e-government services. Quality of services pertains to the perceived accuracy and reliability of these services, while efficiency of services is concerned with the perceived speed and responsiveness of service delivery. Other independent variables include socioeconomic factors, which assess the impact of users' backgrounds on their interaction with e-government services, and technical soundness, which evaluates the performance and security of the e-government platform.

Hypotheses

Four hypotheses guide the study to explore the relationships between these variables. H1 posits that higher perceived ease of access positively correlates with user satisfaction. This hypothesis suggests that citizens' overall satisfaction increases when they find e-government services easy to access. H2 hypothesises that the perceived quality of services positively correlates with user trust, indicating that higher-quality services are likely to build stronger trust among users. H3 suggests that the perceived efficiency of services is positively associated with regular use, implying that citizens are more likely to use the services regularly if they find them efficient. Lastly, H4 posits that increased participation in e-government services is associated with positive perceptions of access, quality, and efficiency, suggesting that active users are likely to have a favourable view of these aspects.

3.4. Sampling

The sample for the quantitative surveys consisted of 113 respondents from Kathmandu Metropolitan City. The majority of respondents were male (60%), with a significant portion holding a bachelor's degree (45%). Most respondents were aged between 30 and 50 years, reflecting the demographic composition of the city's working population. For the qualitative interviews, a purposive sampling method was used to select 14 respondents, including government officials, key users of the e-BPS and engineers, providing detailed insights into the system's implementation and impact.

3.5. Data collection and analysis

The study employed quantitative and qualitative data collection methods to assess citizens' perceptions of e-government services in general, and the specific performance of the e-BPS. A structured survey was administered to 113 participants, covering key areas such as access to e-government services, perceived quality, efficiency, and levels of user participation. The survey was distributed online and physically to ensure broad reach and representation. It included seven sections: demographics, general perceptions of e-government, ease of access, service quality, efficiency of service delivery, user participation, and suggestions for improvement. This allowed for a comprehensive assessment of how citizens engage with e-government services in Kathmandu Metropolitan City.

In addition to the survey, qualitative data were collected through 14 in-depth interviews with stakeholders involved with the e-BPS. These interviews targeted government officials, engineers, and key users of the system, providing insights into its implementation, operational challenges, and impact on service delivery.

The quantitative data from the 113 survey responses were analysed using regression analysis to test the proposed hypotheses. The key focus was examining how independent variables such as access, quality, and efficiency influenced dependent variables like user satisfaction, trust, and participation. Composite scores were calculated for each variable by averaging responses to ensure reliability and consistency.

1) To ensure the validity of the regression models, assumption checks were conducted:
2) Linearity: Examined through scatter plots to confirm a linear relationship between variables.
3) Homoscedasticity: Evaluated by checking residual plots to ensure consistent variance across predicted values.
4) Multicollinearity: Assessed using the Variance Inflation Factor (VIF) to confirm that independent variables were not highly correlated.
5) Normality of Residuals: Verified using Q-Q plots and histograms to confirm the normal distribution of errors.

A thematic analysis was conducted for the qualitative data from the 14 interviews on the e-BPS. Responses were coded to identify recurring themes, such as system efficiency, ease of use, challenges in implementation, and user satisfaction. These qualitative insights provided a more detailed understanding of the e-BPS's impact and performance, adding depth to the broader survey findings on e-government services in Kathmandu Metropolitan City.

3.6. Justification for selecting e-BPS

The e-BPS was chosen for this study due to its significant impact on transforming public service delivery in Kathmandu Metropolitan City. Its success in enhancing transparency and efficiency made it an ideal case study for exploring the broader implications of e-government initiatives.

4. Results

4.1. Objective one results

The analysis under Objective 1 highlights critical factors influencing users' perceptions and interactions with e-government services. The quantitative data confirmed the importance of access, quality, and efficiency in shaping positive user experiences, while qualitative insights revealed barriers related to awareness and security concerns.

The Access Hypothesis was strongly supported, emphasising that ease of access is vital for user satisfaction. This finding underscores the need for e-government platforms to be user-friendly and accessible, ensuring that technological proficiency does not hinder access. Improving accessibility not only enhances satisfaction but also fosters inclusivity.

The Quality Hypothesis also received strong support, particularly its impact on user trust. High-quality services—characterised by accuracy, reliability, and security—are essential for building and maintaining user trust over time.

The Efficiency Hypothesis demonstrates that the speed and responsiveness of services are crucial for regular user engagement, highlighting efficiency as a key driver of ongoing usage.

However, the Participation Hypothesis presented a complex picture, where positive perceptions of access, quality, and efficiency did not necessarily lead to more frequent or deeper engagement with e-government services. This suggests that other factors, such as personal motivations or external influences, may significantly influence engagement.

In conclusion, while technological attributes like accessibility, quality, and efficiency are essential for enhancing user experiences, they must be complemented by strategies that address barriers to adoption. These include awareness campaigns, user education, and robust security measures, all crucial for fostering ongoing engagement with e-government platforms.

4.2. Objective two results

The thematic analysis of the -BPS in Kathmandu Metropolitan City reveals its significant impact on public service delivery. The e-BPS has streamlined operational processes, enhanced data security, and increased transparency, setting a new standard for public services in Kathmandu.

The system's success, particularly in overcoming infrastructural and compatibility challenges, underscores its scalability and potential for broader application. The involvement of diverse stakeholders—government officials, engineers, designers, and homeowners—played a crucial role in refining the system to meet user needs.

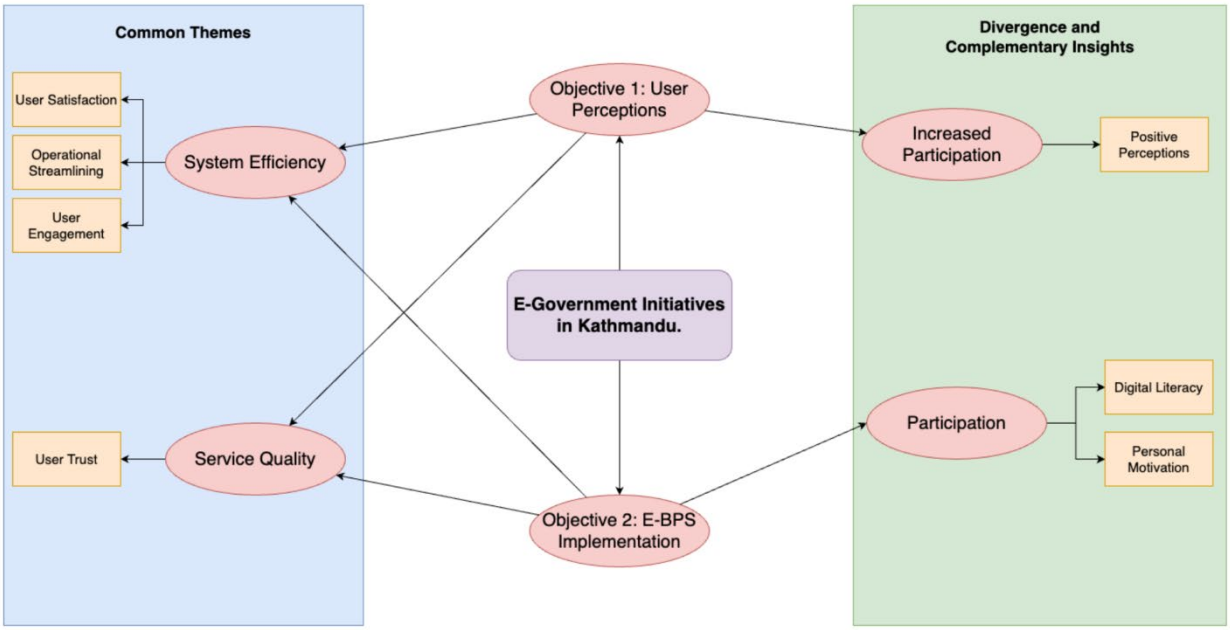
Key themes that emerged include user empowerment and system transparency. E-BPS has improved user experiences by providing real-time updates and reducing the need for physical documentation, thereby fostering trust and a sense of agency among users.

In conclusion, the deployment of e-BPS in Kathmandu stands as a robust example of digital transformation in public services. The ongoing collaboration between technology developers and the community, along with continuous adaptations, is essential for fully realising the benefits of e-government for all stakeholders.

5. Discussion

This section discusses the implications of the findings, relating them to the broader context of e-government in Nepal and similar developing countries. It highlights the successes and challenges of the e-BPS and provides recommendations for improving the system. See Figure 3.

Figure 3: Overview of Integrated Findings



5.1. Summary of key findings

The results of this study provide significant insights into the impact of e-government services in Kathmandu Metropolitan City, particularly through the lens of the e-BPS. The findings support the hypotheses that ease of access, quality, and efficiency are critical determinants of user satisfaction and trust in e-government services. Specifically, the Access Hypothesis was strongly validated, highlighting that user-friendly platforms significantly enhance satisfaction levels. Similarly, the Quality Hypothesis confirmed that high-quality services—marked by accuracy and reliability—are crucial for building user trust. The Efficiency Hypothesis demonstrates that the speed and responsiveness of services are key drivers of regular usage, though their impact on deeper engagement is less pronounced.

However, the study revealed a more nuanced picture regarding user participation. While positive perceptions of access, quality, and efficiency are associated with higher participation levels, they do not necessarily lead to increased engagement with e-government services. This suggests that other factors, such as personal motivations and external influences, may significantly drive sustained engagement.

5.2. Implications for policy and practice

The findings have important implications for policymakers and practitioners involved in e-government initiatives. Enhancing accessibility, maintaining high service quality, and ensuring efficient service delivery should be prioritised to foster user satisfaction and trust. Additionally, targeted strategies to increase user awareness and engagement, such as public education campaigns and improved user support, are necessary to overcome barriers to adoption. The success of the e-BPS serves as a model for other municipalities looking to implement similar digital governance

systems, demonstrating the potential of well-designed e-government platforms to improve public service delivery.

5.3. Sample size limitation

While the study provides valuable insights into the effectiveness of e-government services, particularly the e-BPS in Kathmandu Metropolitan City, one limitation is the relatively small sample size for the quantitative survey (113 participants). Although the data was sufficient for the analysis, a larger and more diverse sample could provide more generalisable results. This limitation highlights the need for future studies to expand the participant pool to better capture the full spectrum of citizen engagement with e-government platforms. Additionally, the qualitative interviews, while insightful, involved a limited number of stakeholders, which may not fully represent the broader perspectives of users.

5.4. Comparative perspectives with India and Bangladesh

The findings of this study align with those from other developing countries, such as India and Bangladesh, where similar challenges and successes in e-government initiatives have been observed. In India, studies of projects like Bhoomi, KAVERI, and eSeva highlight significant improvements in reducing travel time, waiting time, and corruption due to the computerisation of government services (Bhatnagar & Singh, 2010). However, the variation in impacts across different projects suggests that process reforms, such as automation and transparency in handling requests, play a critical role in determining success. Similarly, in Bangladesh, improvements in government service delivery have been linked to digital reforms, yet issues such as inconsistent internet connectivity and limited digital literacy remain substantial barriers (Zhang & Bhattacharjee, 2024). These findings mirror the challenges identified in Kathmandu, where issues such as digital literacy and interface usability impacted user satisfaction and trust. While improvements in service delivery were significant, like in India and Bangladesh, ensuring inclusivity and wider accessibility remains crucial for enhancing user trust and engagement.

In conclusion, while the technological aspects of e-government services are vital, they must be complemented by efforts to engage and educate users, ensuring that these platforms are accessible, trusted, and widely used by the public.

6. Conclusion and future work

This study explored the multifaceted impact of e-government on public service delivery within Kathmandu Metropolitan City, with a particular emphasis on the e-BPS. Through a mixed-methods approach that integrated both quantitative surveys and qualitative interviews, the research provided a holistic understanding of how e-government services can enhance efficiency, transparency, and user satisfaction. The findings demonstrate that ease of access, service quality, and system efficiency are pivotal in shaping positive user experiences with digital government platforms.

The quantitative analysis underscored the strong correlation between ease of access and user satisfaction, revealing that when citizens find e-government services easy to navigate and accessible, their overall trust in the system increases. Service quality, particularly in terms of reliability, accuracy, and security, also emerged as a critical factor influencing user trust, further emphasising the role of robust systems in fostering confidence in digital platforms. Moreover, system efficiency, measured through responsiveness and transaction speed, was found to significantly impact citizens' willingness to engage with e-government services regularly.

The qualitative insights added depth to these findings by highlighting barriers such as limited digital literacy, connectivity issues, and the need for more user-friendly interfaces. Interviews with key stakeholders in the e-BPS system revealed the challenges faced by government officials and users alike, particularly regarding the technical soundness and integration of e-government services. These findings suggest that while the e-BPS has significantly streamlined the building permit process, areas still require improvement, particularly in ensuring that the system is inclusive and accessible to all citizens, regardless of their technological proficiency.

User trust in technology is a critical aspect that, while not extensively explored in this study, warrants attention in the context of e-government services. Trust in technology can be divided into three key factors: technological factors (such as usability, competence, and appearance), user factors (including individual differences), and task factors (such as demand and outcome). These elements collectively influence how users engage with and perceive e-government services (Xu et al., 2014). Although this study did not delve deeply into these factors, exploring them in more detail in future research would provide a greater understanding of how to enhance user trust in digital platforms, which is vital for the long-term success of e-government initiatives. Future studies should prioritise investigating these trust dimensions to design more user-centred and reliable e-government systems.

This research also emphasises the broader implications of e-government for developing countries like Nepal. By improving the efficiency and transparency of public service delivery, e-government initiatives like the e-BPS have the potential to combat corruption, reduce bureaucratic delays, and enhance citizen participation in governance. The study validated the applicability of theoretical frameworks such as the Technology Acceptance Model (TAM) and the Service Quality Model (SERVQUAL), reinforcing the idea that perceived ease of use, usefulness, and service reliability are key drivers of user engagement with digital platforms.

Given the relatively small sample size for the quantitative analysis, future research should aim to validate these findings with a larger, more diverse participant pool. This will help ensure the generalizability of the results and provide a more comprehensive understanding of the impact of e-government services on public service delivery, particularly in contexts similar to Kathmandu Metropolitan City.

As Kathmandu continues its digital transformation, ongoing improvements in user interface design, system integration, and comprehensive digital literacy programs will be necessary to maximise the benefits of e-government services. The study advocates for a more inclusive approach to system design, ensuring that digital platforms cater to the needs of all citizens, including those

with limited digital skills or access to technology. Strengthening public awareness campaigns and providing technical support will be essential for increasing user participation and engagement.

In conclusion, this research provides a valuable reference for other municipalities and developing regions looking to implement similar digital governance initiatives. The successful deployment of the e-BPS offers important lessons in enhancing public service delivery through technology. Yet, it also serves as a reminder of the ongoing challenges in ensuring equitable access to digital services. Policymakers and administrators are encouraged to prioritise user-centred design, continuous system upgrades, and stakeholder engagement to fully realise the transformative potential of e-government in fostering transparency, efficiency, and trust in public services.

Future research should explore several key areas, including conducting longitudinal studies to track changes in user perceptions and the long-term effectiveness of e-government services. Given the relatively small sample size in this study, future work should aim to validate these findings with a larger, more diverse participant pool to ensure broader applicability. Additionally, examining user trust in technology—particularly technological factors like usability, competence, appearance, and user and task factors—would provide valuable insights into enhancing the success of e-government platforms. Expanding the study's scope to other regions in Nepal and assessing the broader impact of e-government on public policy and governance structures will also help refine digital service delivery. Lastly, detailed tests for the e-BPS, including stress tests and usability assessments, could further improve system efficiency and user satisfaction.

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Author Contributions

PT.: Manuscript lead, methodology, data curation, writing and review, statistical/data analysis, project administration.

D.V.E.: Significant contributor, review, resources.

All authors have read and agreed to the published version of the manuscript.

About the Authors

Prabin Thapaliya

Prabin Thapaliya earned his MSc in Information and Communications Technology (ICT) from the Asian Institute of Technology (AIT), Thailand, in 2024. His research focused on the role of e-government and digital transformation in enhancing public service delivery, particularly in Kathmandu Metropolitan City. With a strong background in ICT for development and information management, Prabin is dedicated to applying technology to improve governance and public service efficiency. He is currently working with the United Nations Satellite Center (UNOSAT), where he contributes to humanitarian efforts by utilizing ICT to support data management and decision-making in crisis and development settings.

Vatcharaporn Esichaikul

Vatcharaporn Esichaikul holds a Ph.D. in Management Information Systems from Kent State University, USA, completed in 1992. She also earned an M.B.A. in Computer Systems and Management Science from Oklahoma State University, USA, in 1985, and a B.Acc. (Honors) from Chulalongkorn University, Thailand, in 1983. Her research interests include business intelligence, data analytics, and electronic government. Dr. Esichaikul's contributions to the field are evident through her teaching, research, and publications.

