

Research Article

Navigating Uncertain Terrain: Unveiling the Factors Influencing E-Governance Adoption in the Democratic Republic of the Congo

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Abstract

This research provides a comprehensive examination of the factors influencing e-governance adoption in the Democratic Republic of the Congo. It leverages a combined framework integrating the Unified Theory of Acceptance and Use of Technology and the DeLone and McLean Information Systems Success Model. This approach, integrating specific variables like trust, which encompasses information security, is particularly relevant in the context of the Democratic Republic of the Congo's unique socio-political environment, where digital governance offers significant potential for improving public services and fostering transparency. The research employs a robust methodology, including a survey of 154 respondents and the use of Covariance-based Structured Equation Model analysis to identify the key factors influencing e-governance adoption. The findings provide valuable insights for policymakers and practitioners working on e-governance initiatives, not only in the DR Congo but also in developing countries facing similar challenges. Results show that users value e-governance systems that are easy to navigate and use. The access to accurate and relevant information is essential for effective e-governance adoption. Furthermore, facilitating conditions such as access to resources, knowledge, and compatible technology are crucial for enabling citizen engagement. Additionally, social influence, including social norms and perceived image, impacts users' attitudes and intentions towards e-governance adoption. Building trust in government is critical for encouraging citizen participation and adoption of e-governance services.

Keywords

E-Governance, ICT, Public Administration, DR Congo, Technology Adoption, Is in Developing Countries

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1. Introduction

The 21st century has witnessed a surge in e-governance adoption, with countries leveraging information and communication technologies (ICTs) to transform public administration. E-governance holds immense promise for fostering transparency, efficiency, and citizen participation [13, 36, 38]. It offers a pathway to enhanced service delivery and citizen engagement through digital platforms [62, 1, 36]. However, the journey towards successful e-governance implementation is not uniform across nations. Developing countries, in particular, face unique challenges that can significantly impact adoption rates.

The DR Congo presents a compelling case study for exploring these complexities. Despite the global and Congolese enthusiasm for e-governance, the country's socio-economic and political realities create a significant gap between potential benefits and actual outcomes. [24] analysis resonates with this context, highlighting the difficulties of realizing e-governance's potential amidst resource constraints and political instability [25]. These challenges echo broader concerns regarding fragmented efforts and inadequate infrastructure, as documented by the World Bank's "Digital Dividends" report [63].

This research adopts a focused approach, bridging the optimism surrounding e-governance with the on-the-ground realities of the DR Congo. We draw upon established frameworks like the DeLone and McLean Information Systems Success Model (ISSM) and the Unified Theory of Acceptance and Use of Technology (UTAUT2) to explore the experiences and expectations of citizens regarding e-governance initiatives [15, 59]. This research aims to assess the current state (As-Is Analysis) of e-governance in the DR Congo, by evaluating its impact on citizens and identifying any existing benefits; and investigate the factors influencing its adoption, by employing methodologies outlined by [14] to understand the unique drivers and impediments in the DR Congo's context.

By examining these aspects, we aim to develop insights that can inform the design of context-sensitive ICT-based public policies in the country. This study seeks to bridge the gap between the intended impact of e-governance and its actual effects on citizens, businesses, and national development. Our ultimate goal is to contribute to a more inclusive, efficient, and transparent governance model in the DR Congo.

Following this introductory section, the study proceeds to delineate a critical literature review and DR Congo E-governance As-Is Analysis, establishing a conceptual framework and hypotheses. The subsequent sections cover the research methodology, present findings, and discuss their implications. The conclusion highlights the study's contributions, acknowledges its limitations, and suggests avenues for future research.

2. Literature Review

The advent of ICTs has ushered in a transformative era for governance worldwide, with a pronounced impact in developing countries [47]. This transformation necessitates a comprehensive understanding among stakeholders [62] to foster inclusive governance models [10, 26]. Governance, as defined by [52], encompasses the mechanisms and processes for exercising political and administrative power, a cornerstone for managing national affairs and engaging citizens and communities.

ICT advancements have profoundly impacted public administration, shifting power dynamics towards transparency, accountability, and public engagement [63, 65, 1]. This shift has been instrumental in propelling national information freedom laws and enhancing access to and sharing of information across media platforms. The European Commission [17, 21] emphasizes the foundational role of ICT in modern life, crucial for e-government initiatives that improve public services and democratic processes [13].

E-government from which e-governance derives, inspired by the vision of former U.S. Vice President Al Gore [3], represents the potential for significant advancements in public service delivery and administrative efficiency. It utilizes ICT and digital technologies to streamline government operations, economize on expenditures, and enhance performance [62, 56]. It aspires to simplify governance for all stakeholders – governments, citizens, and businesses – ultimately fostering good governance [54]. This ideal form of governance is characterized by efficiency, legitimacy, credibility, and a citizen-centric approach.

While the existing literature provides a solid foundation, it is essential to acknowledge the rapid pace of technological advancements and the evolving landscape of e-government adoption. This research leveraged some more recent studies on e-government adoption, particularly in other developing countries. This allowed to present a more up-to-date context and further justify the relevance of this research.

Despite global progress in e-governance adoption, the DR Congo faces unique challenges. Its vast area, security concerns, and limited financial resources pose significant hurdles; limited electricity, internet access, and digital literacy make it hard for citizens to use online services. Additionally, legal frameworks around data privacy and ongoing support for these programs need to be established for successful e-governance adoption. The COVID-19 pandemic further highlighted the urgency for e-governance solutions enabling remote access to public services. Examining the experiences of countries like Norway, a leader in e-governance implementation [13, 34], offers valuable insights for the DR Congo.

An analysis of e-government reveals a crucial distinction between front-office services (G2C, G2B) and back-office operations (G2G, G2E) [18, 27, 28, 51, 43, 62]. This distinction is vital for understanding how e-governance functions

across different levels of government and the types of services it encompasses. Notably, the G2E dimension, which has the potential to streamline bureaucracy and enhance intra-governmental relations, remains underexamined [51].

This research addresses the literature gap by providing an empirical framework for assessing e-governance adoption in developing contexts, with a specific focus on the DR Congo. It also extends the combined frameworks, by integrating specific variable like trust, encompassing information security, to tailor the analysis to the DR Congo context. Because strong information security practices are essential for building and maintaining trust between users and organizations [27, 28], which is crucial for successful technology adoption and use. As the second-largest African country by area and the fourth by population, the DR Congo presents a unique case study for exploring the potential and challenges of e-governance in a developing nation. The size of the country, its diverse population, and its ongoing efforts to implement ICT solutions make it a compelling context for examining the factors influencing e-governance adoption and its impact on governance outcomes. Additionally, the limited research on e-governance initiatives in the DR Congo necessitates further investigation to inform future policy and development strategies. This research aims to contribute to the body of knowledge by providing a nuanced understanding of the country's e-governance journey.

3. Research Design and Hypotheses Development

The multifaceted nature of e-governance adoption in developing countries, with a focus on DR Congo necessitates a model that considers both technological and human aspects. To address this, this research integrates two well-established models: the DeLone and McLean ISSM and the UTAUT2.

The ISSM [15] offers a robust framework for evaluating information system success through six key dimensions: information quality, system quality, service quality, system use, user satisfaction, and net benefits. This model provides a lens

to assess the technical and functional aspects of e-governance systems.

Complementing the ISSM, UTAUT2 [59] provides a consolidated view of user intentions and behaviors regarding technology adoption. It integrates key constructs from various models, including Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. These factors directly influence user behavior and intention, while characteristics like gender, age, and experience can moderate these relationships.

Building on the core constructs from ISSM and UTAUT2, we introduce trust (in government and technology) as a critical element for e-governance adoption in the DR Congo. The country's history with governance and technology necessitates a focus on user confidence. Extensive research by scholars such as [6] and [35] highlights the pivotal role of trust in technology adoption, especially in situations where past experiences might lead to skepticism. By integrating trust into the model, we aim to provide a more comprehensive understanding of user behavior in the DR Congo context.

The model, as illustrated in Figure 1, incorporates key constructs from both ISSM and UTAUT2, focusing on those most relevant to e-governance adoption in the DR Congo. We deliberately exclude dimensions of the original models that are less applicable in this context. For example, service quality from ISSM is not explicitly included as it can be subsumed under system quality and information quality in the context of e-governance services. This integrated approach aims to provide a comprehensive understanding of factors influencing e-governance adoption in the DR Congo. It encompasses not only the technical aspects of e-governance systems but also the social, psychological, and trust-related factors critical for successful adoption and use.

This approach fills a gap in existing literature by offering context-specific, empirically grounded insights into e-governance adoption in a challenging yet promising environment. This research contributes to both academic understanding and practical knowledge, providing valuable guidance for implementing and evaluating e-governance initiatives in similar contexts.



Figure 1. Proposed Research Model.

3.1. System Quality and User Engagement in E-Governance

System quality, defined as the overall ease of use, flexibility, and reliability of an e-governance system. Ease of use refers to the user's perception of how effortless it is to learn, navigate, and interact with the system [2]. Flexibility refers to the system's ability to adapt to different user needs and preferences [15]. Reliability refers to the system's consistency in performance and its ability to function without errors or downtime [58].

Hypotheses:

1. H1: System Quality (measured by ease of use, flexibility, and reliability scales) significantly influences Effort Expectancy (perceived ease of using e-governance services).
2. H2: System Quality (measured by ease of use, flexibility, and reliability scales) significantly influences Performance Expectancy (perceived benefits and usefulness of e-governance services).

3.2. Information Quality and User Expectations in E-Governance

Information Quality, defined as the relevance, accuracy, and timeliness of information provided through e-governance services. Relevance refers to the information's direct connection to the user's needs and inquiries. Accuracy refers to the information's correctness and freedom from errors. Timeliness refers to the information being up-to-date and readily available [32].

Hypotheses:

1. H3: Information Quality (measured by relevance, accuracy, and timeliness scales) significantly influences Effort Expectancy (perceived ease of using e-governance services). Users with access to high-quality information are expected to find using the services less effortful.
2. H4: Information Quality (measured by relevance, accuracy, and timeliness scales) significantly influences Performance Expectancy (perceived benefits and usefulness of e-governance services). High-quality information can enhance users' perception of the value and effectiveness of e-governance services.

3.3. Facilitating Conditions and E-Governance Adoption

Facilitating Conditions, defined as the availability of resources and knowledge necessary for using e-governance services, along with the compatibility of the systems with existing technology infrastructure. Resources can include user guides, training materials, and technical support. Knowledge refers to citizens' familiarity with technology and basic computer skills. Compatibility refers to the e-governance system's ability to function seamlessly with users' existing

devices and software [64].

Hypothesis:

H5: Facilitating Conditions (measured by availability of resources, knowledge assessment, and system compatibility scales) significantly influence Citizen Adoption of E-Governance Service. Adequate resources, user knowledge, and compatible systems are expected to encourage citizen use of e-governance services.

3.4. The Role of Social Influence in E-Governance Adoption

Social Influence, defined as the effect of social norms and perceived image on individuals' decisions and behaviors regarding e-governance service use [30]. Social norms refer to the prevailing attitudes and expectations within a community about using e-governance services. Perceived image refers to the social perception associated with using e-governance services (e.g., being seen as modern or efficient) [40].

Hypotheses:

1. H6: Social Influence (measured by social norms and perceived image scales) significantly impacts Effort Expectancy (perceived ease of using e-governance services). Positive social norms and a positive image associated with e-governance use can make the services seem less effortful to adopt.
2. H7: Social Influence (measured by social norms and perceived image scales) significantly impacts Performance Expectancy (perceived benefits and usefulness of e-governance services). Positive social influence can lead to a higher perception of the value and effectiveness of e-governance services.

3.5. Trust in Government and Technology for E-Governance Adoption

Trust, defined as a user's belief in the reliability, competence, security, and legitimacy of both the government and the technology used in e-government services [6, 35, 53]. This belief influences users' willingness to engage with and share personal information through e-governance platforms.

Hypothesis:

H8: Trust (measured by scales assessing perceptions of government reliability, competence, information security, and technology legitimacy) significantly influences Effort Expectancy. Users with higher trust in the government and the technology are likely to perceive using e-government services as less effortful.

3.6. Effort Expectancy as a Predictor of Adoption and Performance in E-Governance

Effort Expectancy, defined as the user's perception of the

ease or difficulty associated with learning, using, and navigating e-government services [30, 59]. This perception is influenced by factors such as system design, user interface complexity, and the availability of support resources.

Hypotheses:

1. H9: Effort Expectancy (measured by perceived ease of use scales) significantly influences E-Governance Adoption. Users who perceive e-government services as easy to use are more likely to adopt and start using them.
2. H10: Effort Expectancy (measured by perceived ease of use scales) significantly influences Performance Expectancy. Users who find e-government services easy to use are more likely to believe that these services will enhance their work efficiency and effectiveness (performance expectancy).

3.7. Performance Expectancy and Its Influence on E-Governance Service Use

Performance Expectance, defined as the user's belief that using e-governance services will enhance their work efficiency, effectiveness, and overall satisfaction [30, 59]. This belief is shaped by the perceived benefits and usefulness of e-governance services in addressing users' needs and accomplishing tasks.

Hypothesis:

H11: Performance Expectancy (measured by perceived benefits and usefulness scales) has a positive influence on the use of e-government services. Users who perceive e-governance services as beneficial and helpful in accomplishing tasks are more likely to adopt and actively use them.

4. Methodology

The DR Congo's journey towards e-governance began in the 2000s, but fragmented and inconsistent computerization efforts resulted from a lack of a comprehensive national strategy [45]. A turning point came with the ambitious "National Digital Plan" of September 2019 [9, 46]. This plan envisioned leveraging digital technologies for integration, good governance, economic growth, and social progress by 2025. It emphasized expanding broadband infrastructure, harnessing big data, bolstering local digital industries, and strengthening human capital and cybersecurity.

Despite these aspirations, the country faces multifaceted challenges. Political crises, ongoing conflict in the eastern parts of the country, and the COVID-19 pandemic have significantly delayed the plan's implementation, particularly integrating ICT into various government departments. The 2022 United Nations e-government survey reflects this underperformance, ranking the DR Congo 175th with an EGDI of 0.3057. Weak service provision and e-participation sub-indexes are the primary reasons for this ranking, while other areas like technology and institutional frameworks show relative strength.

To progress, the DR Congo should prioritize enhancing service provision and e-participation capabilities. This involves not only increasing the supply of e-services but also facilitating broader e-participation by expanding cellular networks and improving electricity supply – crucial factors for boosting digital access [63]. Additionally, attention needs to focus on improving institutional frameworks, offering more engaging and inclusive content, and facilitating access to advanced technologies.

To investigate the factors influencing the use and perception of e-governance among citizens, we employed a quantitative approach using a survey questionnaire. This method aligns with the established standards for gathering user perceptions and experiences in social science research [14].

The survey instrument, meticulously designed with 42 closed-ended questions, was translated into French, the country's official language. To ensure accessibility and widespread reach, Google Forms was chosen for dissemination. The survey was distributed electronically via WhatsApp, Facebook, and Gmail, capitalizing on their popularity and penetration within the country, as evidenced by [50] study on digital connectivity in Kinshasa.

Our sampling strategy aimed for representativeness within practical limitations. Following [33] guidelines, we collected responses from 209 participants. After data cleaning, 154 valid answers were obtained. We think the sample size is consistent to generalize our findings.

The collected data were analyzed using SPSS 27.0 and Amos 27.0 software. These tools enabled to assess the relationships [19] between the identified factors (trust, information quality, system quality, service quality, and facilitating conditions) and user adoption and satisfaction with e-governance services.

The study adhered to ethical research principles, including informed consent, anonymity, and data confidentiality. Participants were informed about the study's objectives, their right to withdraw, and how their data were going to be used.

The data collection and analysis processes were conducted with strict adherence to academic rigor. By employing a structured, methodical approach to our survey, we ensured that our study's findings on e-governance adoption in the DR Congo are not only reliable but also contribute meaningfully to the academic discourse in this field. This meticulous methodology underscores the credibility of our conclusions, providing valuable insights into the dynamics of e-governance adoption in a rapidly evolving technological landscape.

5. Results

Our research's respondent demographic analysis revealed significant insights. Among the 154 responses analyzed, a noteworthy observation was the gender distribution among participants. Male respondents constituted a higher proportion, with female participation estimated at 27.9%. This gender disparity in responses is a critical aspect to consider, as it may

reflect broader societal trends or specific challenges in access and engagement with e-governance services by different gender groups.

Age distribution among respondents further provided an interesting perspective. The most represented age group was individuals in their thirties, accounting for 58.4% of responses, followed by those in their twenties at 29.2%. The representation of other age groups, such as individuals in their forties, fifties, sixties, and above, as well as teenagers, was considerably lower. This age distribution is particularly telling, as it suggests a higher engagement and perhaps a greater familiarity or comfort with digital governance platforms among younger, more technologically adept populations.

In terms of citizen's occupation, 55.2% of the respondents were public servants, a significant figure that underscores the importance of this group's perceptions and experiences in the study of e-governance. Additionally, 29.9% of respondents were employees of NGOs or private companies, 13.6% were students, and 1.3% were jobless. This diverse occupational representation adds a multifaceted perspective to our study, indicating varying levels of exposure and reliance on

e-governance services across different professional backgrounds.

The analysis of respondents' professional experience also yielded valuable insights. The most experienced participants, those with more than 10 years in their field, were the most represented at 44.8%. This was followed by individuals with 4-6 years of experience (18.2%), 7-9 years (16.9%), 1-3 years (14.3%), and those with less than one year of experience (5.8%). The prominence of more experienced professionals in the survey points to a potentially higher level of interaction with governance systems, offering deeper insights into the efficacy and reception of e-governance initiatives.

The demographic composition of our survey respondents provides a crucial backdrop for interpreting the study's findings. It reflects a varied yet skewed representation across gender, age, occupation, and experience, which may influence the perceptions and adoption of e-governance services in the DR Congo. These demographic details not only enrich our understanding of the survey data but also highlight areas for further research, particularly regarding underrepresented groups in e-governance engagement.

Table 1. Reliability and Convergent analysis.

Construct	Indicator	Std. loadings	S.E.	C.R.	AVE	CR
Information Quality	IQ1	0.85			0.75	0.92
	IQ3	0.834	0.068	12.892		
	IQ4	0.914	0.066	14.993		
	IQ5	0.859	0.069	13.562		
Performance Expectancy	PE3	0.931			0.60	0.85
	PE4	0.851	0.073	13.423		
	PE5	0.623	0.072	8.592		
	PE6	0.635	0.07	8.826		
Effort Expectancy	EE2	0.705			0.62	0.87
	EE3	0.801	0.124	9.237		
	EE4	0.839	0.124	8.735		
e-Governance Adoption	AD1	0.704			0.59	0.85
	AD2	0.843	0.115	9.213		
	AD3	0.789	0.122	8.761		
	AD4	0.74	0.112	8.287		
System Quality	SQ1	0.856			0.63	0.89
	SQ2	0.832	0.074	12.821		
	SQ3	0.88	0.078	14.065		
	SQ4	0.848	0.083	13.246		
	SQ5	0.483	0.09	6.184		

Construct	Indicator	Std. loadings	S.E.	C.R.	AVE	CR
Trust	TR1	0.915				
	TR2	0.821	0.093	8.944	0.57	0.79
	TR3	0.457	0.055	5.434		
Social Influence	SI1	0.577				
	SI2	0.505	0.165	4.989	0.43	0.75
	SI3	0.631	0.185	5.858		
	SI4	0.863	0.226	6.511		
Facilitating Conditions	FC4	0.835				
	FC5	0.626	0.094	7.822		
	FC2	0.728	0.084	9.341	0.5	0.83
	FC1	0.706	0.093	9.006		
	FC3	0.585	0.089	7.235		

The assessment of convergent and discriminant validity plays a crucial role in ensuring the reliability and accuracy of our constructs. Convergent validity refers to the degree to which different items measuring the same concept are in agreement. In our case, this concept is particularly relevant to the Social Influence construct in our research model.

According to [20, 4, 22] convergent validity is typically assessed using the AVE value. An AVE value below 0.5 is generally considered inadequate, indicating that, on average, the construct does not explain more than half of the variance of its items. Although the AVE for Social Influence is marginally below the 0.5 threshold, as illustrated in Table 1, the research model retains its validity. This is based on established precedents where an AVE of 0.4 is deemed acceptable, provided the CR surpasses 0.6, as supported by [20, 49, 45].

On the other hand, discriminant validity, also referred to as divergent validity, is the extent to which a construct is truly distinct from other constructs that are theoretically unrelated.

As per the definitions provided by [55, 37], discriminant validity assesses whether constructs that are not supposed to be related are actually unrelated in practice. In our research, discriminant validity was evaluated by comparing the square roots of the AVEs with the correlations between constructs. [20] state that discriminant validity is achieved when the square root of the AVE for each construct is greater than its correlations with other constructs. This approach ensures that each construct captures phenomena not represented by other constructs in the model.

Our evaluation of the Social Influence construct, and indeed all constructs in our research model, involved a thorough examination of both convergent and discriminant validity. By adhering to the guidelines and thresholds established by scholars such as [20, 4, 22, 37, 55], we ensured that our constructs were both internally consistent and distinct from one another, thereby bolstering the reliability and validity of our study's findings.

Table 2. Discriminant Analysis.

	Mean	Std. Dev	IQ	PE	EE	AD	SQ	TR	SI	FC
IQ	4.17	1.41	0.865							
PE	5.25	1.34	0.355	0.772						
EE	5.19	1.05	0.258	0.338	0.787					
AD	5.84	1.10	0.114	0.250	0.343	0.771				
SQ	4.56	1.38	0.370	0.365	0.237	0.338	0.794			
TR	4.69	1.53	0.208	0.097	-0.097	0.094	0.289	0.757		
SI	4.05	1.32	0.276	0.298	0.294	0.422	0.221	0.347	0.658	

	Mean	Std. Dev	IQ	PE	EE	AD	SQ	TR	SI	FC
FC	5.74	0.94	0.407	0.313	0.328	0.560	0.402	0.240	0.370	0.701

The assessment of discriminant validity is crucial to establish the distinctiveness of each construct within our model. According to the guidelines set forth by [20] discriminant validity is substantiated when the square root of the AVE for each latent construct is greater than its correlations with other constructs. Referring to the data presented in table 2, this condition is satisfied as the square root of the AVE for each construct indeed exceeds its correlations with all other constructs. This finding provides robust evidence supporting the discriminant validity of our constructs, ensuring that each one uniquely contributes to our research model without overlapping significantly with others.

The confirmatory factor analysis, evaluating model fit indices, validated the model effectively. As detailed in Table 3,

the analysis demonstrates a good fit across various indices. The absolute fit index, RMSEA, indicates a satisfactory model fit, aligning with established guidelines for a good fit. Both the GFI and AGFI confirm this, falling within acceptable ranges. Incremental fit indices, including the NFI, TLI, and CFI, affirm the model's adequacy, with the NFI value approximating 0.8, suggesting a good relative fit. Likewise, TLI and CFI values meet the recommended thresholds. The parsimony fit indices, such as the PNFI and PCFI, indicate a balance between model complexity and data fit, in accordance with established criteria. Overall, the CFA results underscore a well-fitting model, attesting the validity of the constructs in our research, as supported by literature referenced in Table 3.

Table 3. Model Fit Indices.

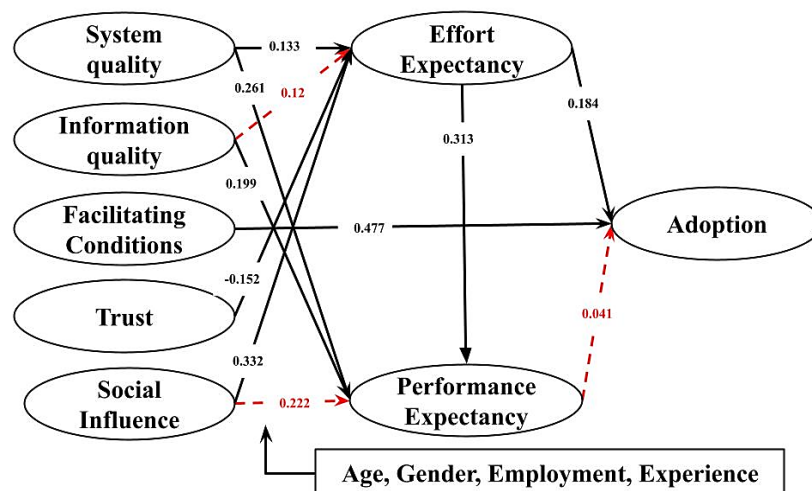
Fit indices	Indicator	Range	Source	
Absolute fit index	$\chi^2(\text{CMIN})/p$	661,262	$p \leq 0.05 \sim 0.10$	[42]
	$\chi^2(\text{CMIN})/p/df$	1.461	$1.0 \leq Q \leq 3.0$	[11]
	RMSEA	0.052	$\leq 0.05 \sim 0.08$	[8]
	RMR	0.07	≤ 0.08	[23]
	GFI	0.804	$\geq 0.8 \sim 0.9$	[31, 41]
	AGFI	0.764 \approx 0.8	$\geq 0.8 \sim 0.9$	[23]
	PGFI	0.668	$\geq 0.5 \sim 0.6$	[41]
Incremental fit index	NFI	0.793 \approx 0.8	$\geq 0.8 \sim 0.9$	[7]
	NNFI (TLI)	0.917	$\geq 0.8 \sim 0.9$	[7]
	CFI	0.927	$\geq 0.8 \sim 0.9$	[7]
Parsimony fit index	PNFI	0.7	≥ 0.6	[29]
	PCFI	0.818	$\geq 0.5 \sim 0.6$	[29]

These results confirm the credibility and importance to our research findings, ensuring that the model accurately reflects the phenomena it measured. Accordingly in the path analysis, we tested several hypotheses about the relationships between different factors. At a 5% significance level (meaning only 5% chance of wrongly rejecting a true hypothesis), three hy-

potheses (H3, H7, and H11) were rejected, suggesting their proposed relationships were unlikely based on our data. The remaining hypotheses (H1, H2, H4, H5, H6, H8, H9, and H10) were accepted, supporting our initial expectations. Table 4 presents the results of the analysis.

Table 4. Hypothesis Testing Analysis.

Code	Variable Path	Estimate	S.E. (β)	C.R. (t-value)	p-value	Result
H1	EE <--- SQ	0.133	0.068	1.967	0.049	accepted
H2	PE <--- SQ	0.261	0.098	2.671	0.008	accepted
H3	EE <--- IQ	0.12	0.062	1.922	0.055	rejected
H4	PE <--- IQ	0.199	0.092	2.161	0.031	accepted
H5	AD <--- FC	0.477	0.096	4.968	***	accepted
H6	EE <--- SI	0.332	0.108	3.068	0.002	accepted
H7	PE <--- SI	0.222	0.142	1.566	0.117	rejected
H8	EE <--- TR	-0.152	0.05	-3.01	0.003	accepted
H9	AD <--- EE	0.184	0.091	2.008	0.045	accepted
H10	PE <--- EE	0.313	0.143	2.191	0.028	accepted
H11	AD <--- EE	0.041	0.054	0.76	0.447	rejected

**Figure 2.** Validated Research Model.

Based on the results on [table 4](#), the [figure 2](#) illustrates the validated research model. This figure visualizes the interconnections between the various constructs in our research design, highlighting the relationships (in solid and black lines) that are statistically significant according to our analysis. It serves as a graphical representation of the confirmed hypotheses, offering a clear and concise overview of the key factors influencing e-governance adoption in the DR Congo, as elucidated by our research.

6. Conclusion

6.1. Discussion

Regarding key findings and contribution, the path analysis yielded valuable insights into the factors influencing

e-governance adoption in the DR Congo. The analysis supported eight out of eleven hypotheses, highlighting the significance of system quality, information quality, facilitating conditions, social influence (on effort expectancy), and effort expectancy (on performance expectancy) in e-governance adoption. These findings align with established theories like UTAUT [59] and ISSM [16], emphasizing the importance of user-centric design, readily accessible services, and a supportive environment for successful e-governance implementation.

However, our research also revealed intriguing deviations from previous studies. Notably, the hypothesized relationship between information quality and effort expectancy was not supported. This finding contrasts with Wang and Liao's [61] observations, suggesting potential cultural or contextual factors at play in the DR Congo. Perhaps, users in the DR Congo

place a greater emphasis on system usability (supported by the positive system quality – effort expectancy hypothesis) when evaluating the ease of interacting with e-governance services. Further research could explore these cultural nuances in more detail.

Another interesting divergence emerged in the relationship between social influence and performance expectancy. While social influence positively impacted effort expectancy, as observed by [59], it did not significantly influence performance expectancy. This suggests that social pressure might encourage users to try e-governance services, but the perceived complexity of these services might supersede social influence in shaping user expectations of performance. This finding warrants further investigation into the unique interplay between social influence and user perceptions in the Congolese context of e-governance adoption.

Our study also sheds light on the nuanced relationship between trust in government and e-service complexity. While previous research by [12, 65] focused on a direct link between trust and perceived ease of use, our findings reveal a more intricate dynamic. In the DR Congo, trust in government appears to influence how users perceive the complexity of e-services. Building trust through transparent and user-friendly e-governance platforms could be crucial for encouraging broader adoption in the DR Congo.

This research not only confirms the applicability of UTAUT and ISSM frameworks in the context of e-governance adoption but also expands the understanding of this phenomenon in developing countries like the DR Congo. The significant role of effort expectancy, aligning with [62] and the broader UTAUT model [59], underscores the importance of minimizing user effort when designing e-government services.

By highlighting the interplay between established theoretical constructs and the unique socio-political context of the DR Congo, this study underscores the importance of considering cultural and contextual factors in technology adoption research.

6.2. Implications

This study offers significant contributions to both theory and practice in the domain of e-governance adoption.

The research extends the UTAUT2 framework by highlighting the critical role of trust and social influence in e-governance adoption within the DR Congo. This aligns with [60] who emphasized these factors in technology acceptance. Furthermore, it underscores the unique challenges faced by developing nations, particularly the crucial influence of political trust on e-governance adoption, echoing [57]'s observations.

The research provides valuable insights for policymakers and technology developers in the DR Congo and similar contexts. It emphasizes the importance of building public trust through government transparency. This focus on trust aligns

with the findings of [12, 65] regarding the trust-technology nexus in e-governance. Additionally, the research highlights the need for user-centric design principles in e-governance services. Easy-to-use interfaces that cater to user needs are crucial, as emphasized by [44, 48].

This research bridges the gap between academic research and practical policymaking. It offers a framework for policymakers and implementers in the DR Congo and similar environments by merging theoretical models with real-world considerations. By providing a holistic understanding of the complex factors influencing e-governance adoption, the study equips stakeholders with strategies to navigate challenges and enhance the effectiveness of e-governance initiatives. It serves as a testament to the intertwined nature of academic research and real-world application, particularly in the evolving field of e-governance in developing countries.

6.3. Limitations and Future Research

While comprehensive, this study on e-governance adoption in the DR Congo presents limitations that suggest avenues for future research. One limitation is the focus on a specific set of constructs drawn from both the DeLone and McLean ISSM and UTAUT2 frameworks. Future studies might explore a broader range of variables relevant to the Congolese context, such as cultural factors, economic conditions, or delve deeper into specific constructs within ISSM or UTAUT2 that emerged as unexpected in this research (e.g., the relationship between information quality and effort expectancy, etc.). Additionally, the study could be expanded to consider alternative theoretical frameworks, such as the Push – Pull – Mooring [39], that might provide further insights into e-governance adoption in developing countries.

Another limitation is the reliance on self-reported data. Subsequent research could incorporate a mixed-methods approach, combining quantitative surveys with qualitative interviews to gain richer insights. The research's geographical focus on the DR Congo limits its generalizability. Future research, with a considerable number of respondents, could compare e-governance adoption across different African countries, offering a broader perspective on the challenges and strategies for implementing e-governance in varied political and social landscapes.

The findings of this study offer valuable insights for policymakers and practitioners working on e-governance initiatives in the DR Congo and similar developing countries. To enhance e-governance adoption, policymakers should prioritize user-centric design, invest in digital infrastructure and capacity building, foster trust in government, and consider cultural and social factors.

By creating systems that are easy to use and intuitive, policymakers can improve citizen engagement and satisfaction. Additionally, investing in robust digital infrastructure and training a skilled workforce is essential for effective e-governance implementation. Building trust in government

institutions is crucial for encouraging citizen participation and adoption of e-governance services. Furthermore, policymakers should tailor e-governance strategies to address the specific cultural norms, social values, and existing governance structures in their respective countries.

By implementing these recommendations, policymakers can create a more enabling environment for e-governance adoption, leading to improved public services and enhanced citizen participation.

Future research could explore additional theoretical frameworks, such as the Push-Pull-Mooring model, to gain a more comprehensive understanding of e-governance adoption. Additionally, investigating other factors such as economic conditions, cultural factors, and political stability could provide valuable insights. Combining quantitative and qualitative research methods can offer richer insights into user experiences and perceptions. Furthermore, comparing e-governance adoption across different African countries can identify common challenges, best practices, and lessons learned.

By addressing these areas, future research can contribute to a more comprehensive understanding of e-governance adoption in developing countries and inform effective policy-making and implementation strategies.

Abbreviations

DR Congo	Democratic Republic of the Congo
UTAUT2	Unified Theory of Acceptance and Use of Technology 2
ISSM	Information Systems Success Model
ICT	Information and Communication Technology
COVID-19	Corona Virus pandemic
AVE	Average Variance Extracted
CR	Composite Reliability
RMSEA	Root Mean Square Error of Approximation
GFI	Goodness of Fit Index
AGFI	Adjusted Goodness of Fit Index
NFI	Normed Fit Index
TLI	Tucker-Lewis Index
CFI	Comparative Fit Index
PNFI	Parsimonious Normed Fit Index
PCFI	Parsimonious Comparative Fit Index
SQ	Service Quality
IQ	Information Quality
FC	Facilitating Conditions
TR	Trust
SI	Social Influence
EE	Effort Expectancy
PE	Performance Expectancy
AD	E-governance Adoption
G2C	Government to Citizens
G2B	Government to Business
G2G	Government to Government
G2E	Government to Employee

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Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Adah, B. A. (2015). The Status and Nature of E-governance in Nigeria. Conference on e-Governance in Nigeria (CUCEN 2015).
- [2] Agarwal, R., & Prasad, J. (2000). Are individual differences germane to the acceptance of internet banking? *Information Systems Research*, 11(4), 346-362.
- [3] Almarabeh, T., & AbuAli, A. (2010). A general framework for e-government: definition maturity challenges, opportunities, and success. *European Journal of Scientific Research*, 39(1), 29-42.
- [4] Bagozzi, R. P., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the academy of marketing science*, 16, 74-94.
- [5] Baležentis, A., & Paražinskaitė, G. (2012). The benchmarking of the government to employee (G2e) technology development: Theoretical aspects of the model construction. *Social Technologies*, 2(1), 53-66.
- [6] Becerra-Fernandez, I., Carter, L., & Ruiz-Quintanilla, S. A. (1999). The role of trust in the formation of consumer intentions to use internet banking. *Journal of Organizational Computing*, 9(1), 1-17.
- [7] Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological bulletin*, 88(3), 588.
- [8] Browne, M. W., & Cudeck, R. (1992). Alternative ways of assessing model fit. *Sociological methods & research*, 21(2), 230-258.
- [9] Cabinet du Président de la République Démocratique du Congo. (2019). *Plan national du numérique: Horizon 2025 - Pour une RDC connecté et performante*. Kinshasa: Présidence de la République Démocratique du Congo.
- [10] Callahan, K. (2007). Citizen participation: Models and methods. *International Journal of Public Administration*, 30(11), 1179-1196.

- [11] Carmines, E. G. (1981). Analyzing models with unobserved variables. *Social measurement: Current issues*, 80.
- [12] Carter, L., & Bédanger, F. (2005). The utilization of e - government services: citizen trust, innovation and acceptance factors. *Information systems journal*, 15(1), 5-25.
- [13] Christensen, T., & Læg Reid, P. (2022). ICT use in central government: Scope, predictors and effects on coordination quality. *International Journal of Public Administration*, 45(3), 273-286.
- [14] Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.
- [15] DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information systems research*, 3(1), 60-95.
- [16] DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: a ten-year update. *Journal of management information systems*, 19(4), 9-30.
- [17] eEurope, B. (2005). An information society for all. *An Action Plan to be presented in view of the Sevilla European Council, COM (2002)*, 263.
- [18] Emrah Kanat, İ., & Özkan, S. (2009). Exploring citizens' perception of government to citizen services: A model based on the theory of planned behaviour (TBP). *Transforming Government: People, Process and Policy*, 3(4), 406-419.
- [19] Field, A. (2013). *Discovering statistics using IBM SPSS statistics*. sage.
- [20] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- [21] Guijarro, L. (2007). Interoperability frameworks and enterprise architectures in e-government initiatives in Europe and the United States. *Government Information Quarterly*, 24, 89-101.
- [22] Hair, J. F. (2009). *Multivariate data analysis*.
- [23] Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the academy of marketing science*, 40, 414-433.
- [24] Heeks, R. (2001). Understanding e-governance for development.
- [25] Heeks, R. (2006). *Implementing and managing e-government: An international text*. Sage.
- [26] Holzer, M., & Kloby, K. (2005). Public performance measurement: An assessment of the state - of - the - art and models for citizen participation. *International Journal of Productivity and Performance Management*, 54(7), 517-532.
- [27] Hussein, R., Mohamed, N., Ahlan, A. R., Mahmud, M., & Aditiawarman, U. (2010). G2C adoption of e-government in Malaysia: Trust, perceived risk and political self-efficacy. *International Journal of Electronic Government Research (IJEGR)*, 6(3), 57-72.
- [28] Hussein, R., Mohamed, N., Rahman Ahlan, A., & Mahmud, M. (2011). E - government application: an integrated model on G2C adoption of online tax. *Transforming Government: People, Process and Policy*, 5(3), 225-248.
- [29] James, L. R., Mulaik, S. A., & Brett, J. M. (1983). *Causal analysis: Assumptions, models, and data*. Beverly Hills (Calif.): Sage, 1983.
- [30] Jeng, D. J. F., & Tzeng, G. H. (2012). Social influence on the use of clinical decision support systems: revisiting the unified theory of acceptance and use of technology by the fuzzy DEMATEL technique. *Computers & Industrial Engineering*, 62(3), 819-828.
- [31] Jöreskog, K. G., Sörbom, D., & Magidson, J. (1979). Advances in factor analysis and structural equation models. (*No Title*).
- [32] Kolodner, J. A., Perry, M., & Kibler, D. (1998). Educational technology for libraries. *Library Trends*, 47(1), 3-30.
- [33] Krejcie, R., & Morgan, S. (1970). Sample size determination. *Business Research Methods*, 4(5), 34-36.
- [34] Læg Reid, P., & Rykkja, L. H. (2016). Administrative reforms. Processes, trends and content. In C. Greve, P. Læg Reid, & L. H. Rykkja (Eds.), *Nordic administrative reforms. Lessons for public management* (pp. 105- 128). PalgraveMacmillan.
- [35] Lee, M. D., & Turban, E. (2001). A trust-based framework for web site evaluation. *Journal of Computer Information Systems*, 41(4), 178-187.
- [36] Meijer, A., Bolivar, & Gil-Garcia, J. R. (2018). From E-government to digital era governance and beyond: Lessons from 15 years of research into information and communication technology in the public sector. *Journal of Public Administration Research and Theory*. Online First.
- [37] Messick, S. (1989). Meaning and values in test validation: The science and ethics of assessment. *Educational researcher*, 18(2), 5-11.
- [38] Miah, S. J. (2013). An e-Government approach for bridging the participation gap in achieving participatory good governance. *International Journal of Electronic Government Research (IJEGR)*, 9(2), 85-100.
- [39] Moon, B. (1995). Paradigms in migration research: exploring 'moorings' as a schema. *Progress in human geography*, 19(4), 504-524.
- [40] Moore, G. C., & Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, 2(3), 192-222.
- [41] Mulaik, S. A., James, L. R., Van Alstine, J., Bennett, N., Lind, S., & Stilwell, C. D. (1989). Evaluation of goodness-of-fit indices for structural equation models. *Psychological bulletin*, 105(3), 430.

- [42] Muthén, B., & Kaplan, D. (1985). A comparison of some methodologies for the factor analysis of non-normal Likert variables. *British Journal of Mathematical and Statistical Psychology*, 38(2), 171-189.
- [43] Nasseef, O. A., Baabdullah, A. M., Alalwan, A. A., Lal, B., & Dwivedi, Y. K. (2022). Artificial intelligence-based public healthcare systems: G2G knowledge-based exchange to enhance the decision-making process. *Government Information Quarterly*, 39(4), 101618.
- [44] Nielsen, J. (1994). *Usability engineering*. Morgan Kaufmann.
- [45] Nyazabe, S. N., Hwang, G. H., & Manyole, O. B. (2023). Influential Factors in the Implementation of an Educational Blockchain System in the Democratic Republic of the Congo: Case of Higher Education Institutions. *International Journal of Educational Reform*, 10567879231217481.
- [46] Panza, J. (2019). L'histoire du numérique en République Démocratique du Congo.
- [47] Pathak, R. D., Naz, R., Rahman, M. H., Smith, R. F. I., & Nayan Agarwal, K. (2009). E-governance to cut corruption in public service delivery: A case study of Fiji. *Intl Journal of Public Administration*, 32(5), 415-437.
- [48] Petter, S., DeLone, W., & McLean, E. (2008). Measuring information systems success: models, dimensions, measures, and interrelationships. *European journal of information systems*, 17, 236-263.
- [49] Psaila, G., & Wagner, R. (Eds.). (2007). *E-Commerce and Web Technologies: 8th International Conference, EC-Web 2007, Regensburg, Germany, September 3-7, 2007, Proceedings* (Vol. 4655). Springer.
- [50] Pype, K. (2021). (Not) in sync—digital time and forms of (dis-)connecting: ethnographic notes from Kinshasa (DR Congo). *Media, Culture & Society*, 43(7), 1197-1212.
- [51] Rao, V. R. (2011). Collaborative government to employee (G2E): Issues and challenges to e-government. *Journal of e-Governance*, 34(4), 214-229.
- [52] Rondinelli, D. A. (2006). *Public administration and democratic governance: Governments serving citizens*. © United Nations, All rights reserved.
- [53] Santa, R., MacDonald, J. B., & Ferrer, M. (2019). The role of trust in e-Government effectiveness, operational effectiveness and user satisfaction: Lessons from Saudi Arabia in e-G2B. *Government Information Quarterly*, 36(1), 39-50.
- [54] Srivastava, A., & Thomson, S. B. (2009). Framework analysis: a qualitative methodology for applied policy research.
- [55] Straub, D., Boudreau, M. C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information systems*, 13(1), 24.
- [56] Subhajib, B. (2004). E-government and developing countries: an overview. *International Review of Law, Computers & Technology*, 18(1), 109-132.
- [57] Tennakoon, W. D. N. S. M. (2020). E-governance way forward: challenges and opportunities for developing countries. Evidences from Sri Lanka. *International Journal of Business, Economics and Law*, 21(2), 51-61.
- [58] Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: End user adoption in MIS. *Communications of the ACM*, 34(1), 114-121.
- [59] Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- [60] Venkatesh, V., Thong, J. Y., & Xu, X. (2012). Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology. *MIS quarterly*, 157-178.
- [61] Wang, Y. S., & Liao, Y. W. (2008). Assessing eGovernment systems success: A validation of the DeLone and McLean model of information systems success. *Government information quarterly*, 25(4), 717-733.
- [62] Wirtz, B. W., & Piehler, R. (2016). eGovernment Applications and public personnel acceptance: an empirical analysis of the public servant perspective. *International Journal of Public Administration*, 39(3), 238-247.
- [63] World Bank Group. (2016). *World development report 2016: Digital dividends*. World Bank Publications.
- [64] Yi, M. Y., Jeong, S., & Lai, F. (2006). The role of facilitating condition in knowledge management system success: A meta-analysis. *The Journal of High Technology Management Research*, 17(1), 80-94.
- [65] Zhao, F., & Khan, M. S. (2013). An empirical study of e-government service adoption: culture and behavioral intention. *International Journal of Public Administration*, 36(10), 710-722.

Research Fields

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