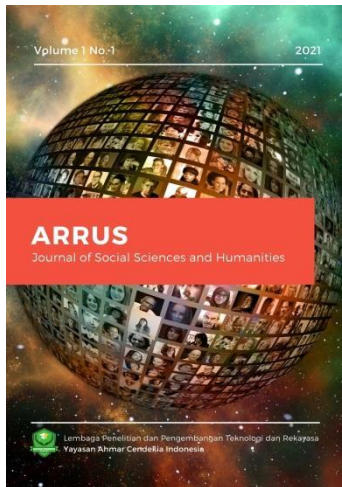




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RESEARCH ARTICLE

Strengthening Public Trust and Citizen Engagement Through E-Government Application Innovation: The Intervening Role of E-Government Effectiveness In Medan City

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Abstract: This study aims to examine the influence of E-Government application innovation on public trust and citizen engagement through E-Government effectiveness as an intervening variable in Medan City. The study is motivated by the continuing reliance on manual public service systems, which often create administrative delays, limited accessibility, low transparency, and insufficient citizen participation. In response to these challenges, E-Government application innovation is expected to strengthen digital public service delivery by improving service availability, accessibility, transparency, operational efficiency, and public participation. This study employs a descriptive quantitative approach using Structural Equation Modeling (SEM). The population consists of 2,494,512 residents of Medan City in 2023, and the sample comprises 100 respondents selected using stratified random sampling based on educational level. The results show that all measurement indicators satisfy convergent validity, discriminant validity, and composite reliability requirements. The hypothesis testing results indicate that E-Government application innovation has a significant effect on public trust, citizen engagement, and E-Government effectiveness. Furthermore, E-Government effectiveness significantly influences public trust and citizen engagement. The indirect effect analysis also confirms that E-Government effectiveness plays an intervening role in strengthening the influence of E-Government application innovation on both public trust and citizen engagement. These findings suggest that innovative and effective E-Government applications are essential for building citizen confidence, encouraging public participation, and improving the quality of digital public services in Medan City.

Keywords: E-Government Application Innovation, E-Government Effectiveness, Public Trust, Citizen Engagement, Digital Public Services.

1. Introduction

Public service must be understood comprehensively by both state and local government apparatuses, as it represents one of the most fundamental responsibilities of government in meeting citizens' needs. Government officials are expected to respond effectively to directions, guidance, and instructions from their superiors in order to improve the effectiveness and efficiency of service delivery. The ability of public apparatuses to provide reliable and responsive services constitutes an essential foundation for improving public service quality and strengthening the government's capacity to serve society more effectively (Al-Besher, Abdulaziz and Kumar, 2022). In practice, however, public service delivery in



many local government institutions remains largely manual and relies heavily on direct, face-to-face interaction between public officers and citizens. This form of service remains necessary in certain situations, particularly when citizens have limited knowledge or understanding of how to use service applications provided by either central or local governments (Uyar, Ali, 2021). Nevertheless, manual public service delivery is highly dependent on human resources recruited through formal staffing processes. Although recruitment is intended to ensure the availability of competent personnel, some state and local government apparatuses still tend to provide services that are complicated, bureaucratic, and difficult for citizens to access. Such practices may create public dissatisfaction and generate antipathy toward government officers who are perceived as unresponsive or obstructive (Forastero, 2023). Manual public service systems have several fundamental weaknesses. First, manual procedures often require more time because every stage is carried out physically without the support of automated technology. Services that depend on paper-based forms, physical queues, and manual data processing tend to slow response times and delay the completion of public requests (Cordella, 2019). Second, manual processes are more vulnerable to human error, including data entry mistakes, lost documents, and other administrative inaccuracies. Handwritten data may also be difficult to read or interpret, thereby increasing the possibility of errors and slowing administrative work. As a result, public apparatuses often need additional time to revise and correct administrative mistakes, which ultimately leads to ineffective service delivery (Simmons, Cassandra, 2024). In addition, manual public services usually require more personnel, which increases operational costs. They also often require citizens to be physically present at government offices, creating barriers for individuals who live in remote areas or have limited mobility. Limited operating hours further restrict access for citizens who cannot obtain services during standard working hours (Rathi, 2024). Manual systems also tend to be less transparent because it is difficult to track the status of requests or ensure that all procedures are properly followed. Accountability becomes another concern because each stage of the manual service process is difficult to audit and verify (Hashmi, Faiz A., 2023). Moreover, manual systems are less flexible when government policies change or when public needs evolve, as procedural adjustments usually require more time, personnel, and resources. Although manual services are still needed in certain contexts, digital technology offers significant potential to overcome these limitations by improving efficiency, security, transparency, and accessibility in public service delivery (Adam, 2020). The limitations of manual systems have become increasingly evident in the era of rapid digital transformation. Public services are now expected to be fast, accurate, efficient, effective, and free from unnecessary bureaucratic complexity. Manual systems can be replaced or complemented by digital systems that are capable of delivering services within a shorter period of time (Arayankalam, Jithesh, Khan, Anupriya, and Krishnan, 2021). In this context, E-Government has emerged as a strategic digital innovation that enables governments to provide information and public services through technology-based platforms. E-Government can improve service acceptability by enabling governments to transform conventional services into digital applications that are accessible through smartphones and other digital devices (Janairo, 2021). Through higher public acceptability, E-Government initiatives are expected to support faster and more efficient service delivery, improve public service quality, and strengthen the government's ability to provide optimal services to society (German, Josephine D., 2023). Besides acceptability, work efficiency is another crucial factor in the successful implementation of E-Government. Public service procedures that were previously complicated, dependent on excessive human resources, slow in response, and time-consuming in correction processes often resulted in inefficiency. Therefore, initiatives from both central and local governments are required to develop public service systems that are more integrated, responsive, and citizen-oriented (Muñoz, Alcaide Laura, Bolívar, Manuel Pedro Rodríguez and Muñoz, 2023). E-Government should not merely be interpreted as the digitization of administrative procedures, but also as an institutional intervention that can improve work efficiency, strengthen government responsiveness, and enhance the overall quality of public services. E-Government is part of

the development of digital applications designed to integrate various public service functions into a single service platform. Through such integration, E-Government is expected to serve citizens more effectively as users of digital public service applications. It can also create measurable forms of service delivery and improve the institutional capacity of organizations that utilize these applications. The main purpose of E-Government is to improve efficiency and effectiveness in the provision of public services. Digitalization accelerates and optimizes bureaucratic processes, allowing public services to achieve their objectives while enabling public complaints to be addressed through digital platforms (Abdulkareem, Abdulrazaq Kayode and Mohd Ramli, 2022). Furthermore, E-Government facilitates broader access to public information and thereby strengthens transparency. It supports the monitoring and evaluation of government performance, which in turn enhances public accountability. Accountability in E-Government aims to create services that are properly targeted, responsive to existing problems, and capable of resolving issues faced by citizens (Demeshko, Anastassia, 2022). E-Government also enables governments to continuously improve service innovation that was previously dominated by manual activities. Policies and service programs that were not previously integrated into a digital platform can be incorporated into an application, thereby expanding service coverage, accommodating public information, messages, and complaints, and responding to citizens who remain dissatisfied with both manual and digital services (Hardy, Andy, 2022). Service innovation in E-Government must be designed to meet citizens' expectations and preferences regarding the types of services they need. E-Government applications should integrate services across institutions through a one-stop service approach, replacing fragmented and multi-door service systems that often require long, complicated, and costly procedures. Such bureaucratic complexity may disadvantage citizens, even though public services should ideally be fast, simple, accessible, and affordable (Hyytinen, Ari, Tuimala & and Hammar, 2022). Another important innovation is the ease of use of E-Government applications, which enables citizens to access government services anytime and anywhere without having to visit government offices physically. This is particularly beneficial for individuals living in remote areas (Jameel et al., 2019). E-Government also provides a platform for citizens to contribute to decision-making processes through online public consultations, surveys, and discussion forums (Amoah, Benjamin, 2023). Citizens can also provide criticism and suggestions through comment features in E-Government applications. Such input is necessary for the government to transform public complaints into policy responses. In this way, E-Government can generate comprehensive solutions, not only to improve service quality but also to expand the range of digital services that genuinely correspond to public needs (Ly, Bora and Ly, 2023). Digitalization of public services can also reduce government operational costs by minimizing paper use, accelerating service time, and improving efficiency in resource management. Digital applications no longer require paper-based records but instead demand accurate and rapid data entry, thereby eliminating the need for handwritten data and physical file storage, both of which are less effective and less efficient (Batidzirai, Bothwell, 2021). Manual file storage requires substantial time for data retrieval and may lead to wasted time and public dissatisfaction. By contrast, E-Government applications allow data to be recorded, stored, and retrieved quickly without relying on manual equipment, making services more practical, effective, efficient, and accessible to a wider population (Kyriakidis, Charalampos, 2023). The rapid advancement of information and communication technology requires governments to adapt and utilize digital technology to improve public service quality. The better and more reliable the services provided, the more effective the implementation of E-Government becomes. This condition can create convenience for citizens and reduce difficulties in using digital service applications (Montt-Blanchet, Denise, Najmi, Sheba, and Spinillo, 2023). E-Government application innovation that is able to detect public problems and respond to service expectations creates the need to improve application effectiveness, which may subsequently increase citizen engagement in supporting E-Government implementation (Rosas, Etienne, 2021). Such innovation can also enhance the effectiveness of service integration, increase user satisfaction, and create public services that are effective and sustainable (Mulyasari, F.,

2021). In the era of globalization, countries are required to improve their competitiveness, including in terms of government effectiveness and efficiency. E-Government is one way to achieve this objective, as it can strengthen the image of government in the eyes of citizens by providing participatory services, increasing satisfaction in handling complaints, and resolving public problems more wisely (Okada, Hiroko, 2023). E-Government also facilitates better data management and analysis, which can support more informed and evidence-based decision-making. At the same time, the protection of public and government data must be strengthened to ensure that citizens perceive the government as truly serving and protecting their interests, including by responding quickly to public complaints and safeguarding personal and institutional data within E-Government systems (Twizeyimana, Jean Damascene, and Andersson, 2019). Medan City represents an important context for examining the implementation of E-Government in local public service delivery. With a population of approximately 2,494,512 people in 2023, Medan requires a public service system that is efficient, accessible, responsive, and capable of reaching all segments of society. However, public services in Medan still depend largely on manual systems, while the use of E-Government remains partial and has not yet been implemented optimally. This indicates that service innovation through E-Government has not been fully developed, and the effectiveness of E-Government applications has not significantly improved. Existing services have not been able to reach the entire population of Medan City and have not fully involved citizens in the service process. Consequently, public trust in the Medan City Government may decline, and citizens may experience dissatisfaction when using E-Government services because the available services do not yet fully correspond to their expectations and needs.

Based on this background, the research problem of this study is formulated as follows: how does E-Government application innovation influence the improvement of public trust and citizen engagement through the effectiveness of E-Government as an intervening variable? Accordingly, this study aims to examine and analyze the influence of E-Government application innovation on public trust and citizen engagement through the effectiveness of E-Government as an intervening variable in Medan City.

2. Literature Review

2.1. *E-Government Application Innovation*

Innovation in E-Government applications is essential for improving public service quality, operational efficiency, and citizen participation. In the public sector, innovation is not merely the introduction of technology, but also the redesign of service processes so that government services become more integrated, accessible, transparent, and responsive to citizens' needs (Arayankalam, Jithesh, Khan, Anupriya, and Krishnan, 2021). Therefore, E-Government innovation should be directed toward strengthening the capacity of government institutions to deliver faster, simpler, and more inclusive public services. Several forms of innovation can be developed within E-Government, including integrated service portals, mobile government, e-learning platforms, and the application of augmented reality and virtual reality to support more interactive and adaptive public services (Ni et al., 2021). These innovations are expected to reduce fragmented service procedures and create a more user-oriented digital service ecosystem. In this study, E-Government application innovation is reflected through the indicators of service availability, accessibility, user satisfaction, transparency, operational efficiency, and public participation (Cortés-Cediel, María E., 2023).

2.2. *E-Government Effectiveness*

The effectiveness of E-Government can be evaluated through indicators that show the extent to which information and communication technology improves government performance and the quality of public service delivery (van der Giessen, Mark and Bayerl, 2022). An effective E-Government system should not only provide digital access, but should also ensure that digital services are useful, timely, responsive, and capable of solving public service problems more efficiently. The more effective E-Government is, the greater its ability to serve

citizens and improve the quality of services provided by government institutions (Ratio, Marnel Arnold, Gabo-Ratio, Jillian Aira and Fujimitsu, 2020). In this study, E-Government effectiveness is measured through the use of technological services, public participation, user satisfaction, and timeliness (Alhaffar, MHD Bahaa Aldin, Joury, Easter, and Eriksson, 2023). These indicators are important because they represent both the technical performance of digital services and the citizens' experience in using them.

2.3. Improvement of Public Trust

One of the main objectives of developing and implementing digital government technology is to increase public trust in E-Government. Public trust is a critical element because it influences citizens' willingness to adopt, use, and participate in E-Government services (Esponda, Georgina Miguel, 2022). Without trust, digital public services may be underutilized even when technological infrastructure is available. Increasing public trust in government and E-Government services is a continuous and multidimensional process (Shahzad, Muhammad Farrukh, 2023). Trust can be strengthened when government services are transparent, accountable, responsive, and capable of providing satisfactory outcomes for citizens. Therefore, the indicators used to measure the improvement of public trust in this study include transparency, accountability, satisfactory services, and quick response (Panayiotou et al., 2021).

2.4. Improvement of Citizen Engagement

Citizen engagement in E-Government is important to ensure that public services and policies are aligned with citizens' needs, expectations, and aspirations (Afieroho, Peace, 2023). E-Government should not only function as a one-way digital service channel, but also as a participatory platform that enables citizens to communicate, provide feedback, and contribute to public decision-making. Strategies to improve citizen engagement include enhancing the quality of online public consultations, providing comment features, enabling response channels, and creating digital discussion forums (Zou et al., 2023). Through these mechanisms, citizens can express opinions, submit complaints, and contribute to improving the quality of public services. In this study, citizen engagement is reflected through community participation, responses and feedback, and public response (Stewart, Rebecca E., 2021).

2.5. Research Variables and Indicators

Table 1. Variables and Indicators

Variable	Conceptual Focus	Indicators
E-Government Application Innovation (X)	The development and renewal of digital public service applications to create more integrated, accessible, transparent, and participatory services.	Service availability; accessibility; user satisfaction; transparency; operational efficiency; public participation.
E-Government Effectiveness (Z)	The extent to which digital government services improve service performance, responsiveness, and public service quality.	Use of technological services; public participation; user satisfaction; timeliness.
Public Trust Improvement (Y1)	The strengthening of citizens' confidence in government and digital public services.	Transparency; accountability; satisfactory services; quick response.
Citizen Engagement Improvement (Y2)	The extent to which citizens participate, provide feedback, and respond to digital public service processes.	Community participation; responses and feedback; public response.

2.6. Conceptual Framework

The conceptual framework of this study positions E-Government application innovation as the independent variable, E-Government effectiveness as the intervening variable, and the improvement of public trust and citizen engagement as the dependent variables. This framework assumes that innovation in E-Government applications can directly improve public trust and citizen engagement, while also indirectly influencing both outcomes through the effectiveness of E-Government.



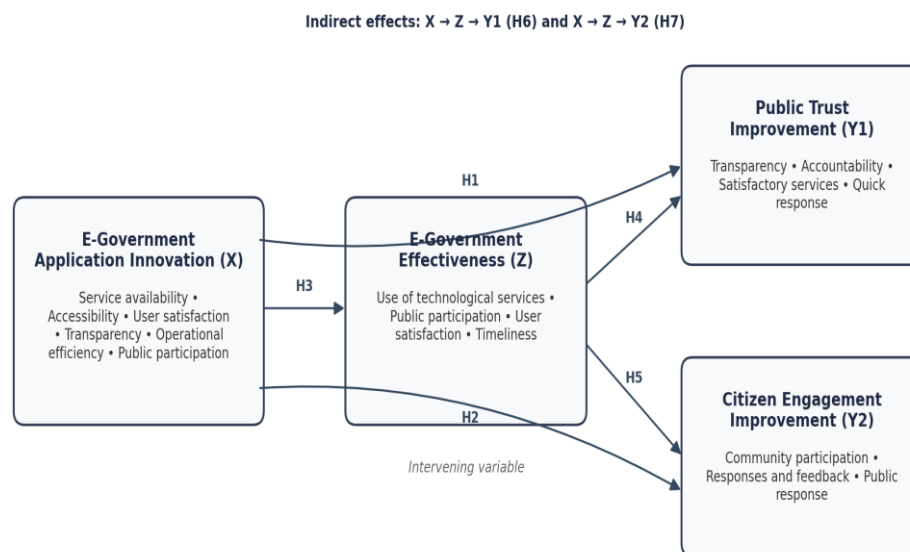


Figure 1. Conceptual Framework

2.7. Research Hypotheses

H1: E-Government application innovation has a significant effect on the improvement of public trust in Medan City.

H2: E-Government application innovation has a significant effect on the improvement of citizen engagement in Medan City.

H3: E-Government application innovation has a significant effect on E-Government effectiveness.

H4: E-Government effectiveness has a significant effect on the improvement of public trust in Medan City.

H5: E-Government effectiveness has a significant effect on the improvement of citizen engagement in Medan City.

H6: E-Government application innovation has a significant effect on the improvement of public trust in Medan City through E-Government effectiveness as an intervening variable.

H7: E-Government application innovation has a significant effect on the improvement of citizen engagement in Medan City through E-Government effectiveness as an intervening variable

3. Research Method and Materials

This study employs a descriptive quantitative method and analyzes the data using Partial Least Squares Structural Equation Modeling (PLS-SEM). This approach is appropriate because the study examines relationships among several latent constructs and tests both direct and indirect effects among variables. PLS-SEM is also suitable for exploratory and prediction-oriented models, especially when the study focuses on explaining variance in endogenous constructs and when the research context has not been widely examined. The population consists of 2,494,512 residents of Medan City in 2023. Because the population is large and heterogeneous, the sampling procedure uses stratified random sampling based on educational level so that respondents from different educational backgrounds are represented. The

sample size was determined using the Slovin formula with a 10% margin of error. Although the resulting sample of 100 respondents is modest for a complex SEM model, it was retained because the analysis was conducted using PLS-SEM and the model was evaluated as an exploratory local-governance study. The adequacy of the sample was also considered in relation to the number of structural paths directed to the endogenous constructs and the strength of the obtained outer loadings, composite reliability, and R-square values. Nevertheless, the sample size remains a methodological limitation. The findings should therefore be interpreted as evidence from a focused exploratory study rather than as a definitive generalization for all residents of Medan City. Future studies should use a larger sample, apply broader demographic stratification, and compare different districts or service types to increase statistical power and generalizability. Zou et al. (2023) state that SEM is a data analysis method designed to understand interactions among construct variables; therefore, it is relevant for testing the proposed research model.

$$n = N / (1 + Ne^2)$$

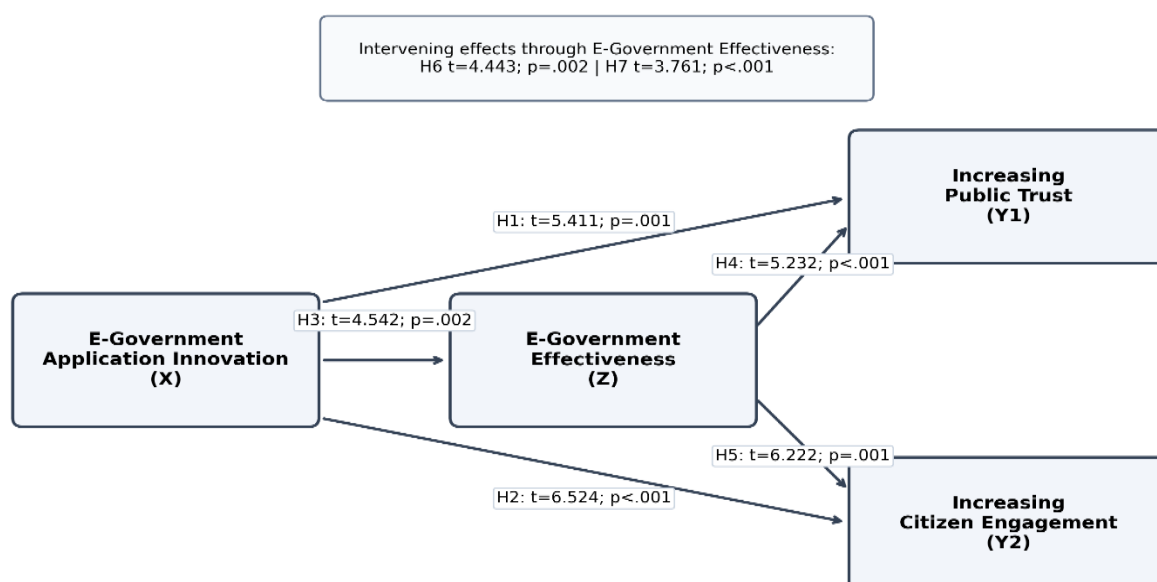
$$n = 2,494,512 / (1 + 2,494,512 \times 0.10^2) = 99.99 \approx 100$$

Thus, the sample used in this study consists of 100 residents of Medan City:

4. Results and Discussion

4.1. Results

The results of the structural equation modelling (SEM) analysis are presented to explain the relationships among E-Government application innovation, E-Government effectiveness, public trust, and citizen engagement. The bootstrapping output provides empirical evidence regarding the direct and indirect effects among the research constructs. The SEM bootstrapping model is summarized in Figure 2



All proposed hypotheses are supported based on bootstrapping results.

Figure 2. SEM Bootstrapping Diagram

Source: Processed by the author based on PLS bootstrapping results, 2024.

4.1.1. Convergent Validity Analysis



According to Zou et al. (2023), convergent validity analysis is used to examine the validity of the indicators that form each latent construct. In this study, convergent validity was evaluated using outer loading values. The results show that all indicators have outer loading values above the recommended threshold, indicating that each indicator adequately reflects its respective construct.

Table 2. Convergent Validity Test

Construct	Indicator	Outer Loading
E-Government Application Innovation (X)	IAEG 1	0.857
	IAEG 2	0.873
	IAEG 3	0.865
	IAEG 4	0.810
	IAEG 5	0.836
	IAEG 6	0.828
Increasing Public Trust (Y1)	PKM 1	0.866
	PKM 2	0.875
	PKM 3	0.874
	PKM 4	0.876
Increasing Citizen Engagement (Y2)	PPM 1	0.844
	PPM 2	0.835
	PPM 3	0.837
	PPM 4	0.806
E-Government Effectiveness (Z)	EEG 1	0.882
	EEG 2	0.769
	EEG 3	0.824

Source: Data processed with PLS 3.0, 2024.

Table 2 indicates that the data for each construct have satisfied the validity requirement. The outer loading values are consistently high, which means that the measurement items are appropriate for representing the constructs used in the model.

4.1.2. Average Variance Extracted (AVE) Analysis

Zou et al. (2023) explain that the Average Variance Extracted (AVE) test is used to determine whether the data for each construct are valid and suitable for further analysis. The AVE results are presented in Table 3.

Table 3. Average Variance Extracted (AVE) Test

Construct	AVE
E-Government Application Innovation (X)	0.836
Increasing Public Trust (Y1)	0.876
Increasing Citizen Engagement (Y2)	0.855
E-Government Effectiveness (Z)	0.856

Source: Data processed with PLS 4.0, 2024.

As shown in Table 3, all AVE values are greater than 0.50. This demonstrates that each construct has sufficient convergent validity and that the data are appropriate for use in the subsequent SEM analysis.

4.1.3. Composite Reliability Analysis

Composite reliability analysis is conducted to assess whether the indicators of each construct are internally consistent and reliable for data processing (Zou et al., 2023). The results of the composite reliability test are presented in Table 4.

Table 4. Composite Reliability Test

Construct	Composite Reliability
E-Government Application Innovation (X)	0.888
Increasing Public Trust (Y1)	0.828
Increasing Citizen Engagement (Y2)	0.878
E-Government Effectiveness (Z)	0.858

Source: Data processed with PLS 4.0, 2024.



Table 4 shows that the composite reliability values are greater than 0.60. Therefore, the indicators used in this study are considered reliable and suitable for measuring the latent constructs.

4.1.4. Discriminant Validity Analysis

In confirmatory factor analysis (CFA) and structural equation modelling (SEM), discriminant validity analysis is used to determine the extent to which each construct is empirically distinct from other constructs in the model. The discriminant validity results are presented in Table 5.

Table 5. Discriminant Validity Analysis

Construct	Public Trust Moderating Effect 1	Public Trust Effect 2	Public Trust Moderating Effect 3	Public Trust Moderating Effect 4
E-Government Application Innovation	0.752	1.000	0.757	0.622
Increasing Citizen Engagement	0.666	0.832	1.000	0.722
Increasing Public Trust	0.757	0.782	0.837	1.000
E-Government Effectiveness	1.000	0.742	0.666	0.632

Source: Data processed with PLS, 2023.

Based on Table 5, the values generated from the data processing indicate that the model has fulfilled the discriminant validity requirement. This means that the constructs in the study can be empirically distinguished from one another.

4.1.5. Path Coefficient and R-Square Analysis

The explanatory power of the structural model was assessed using R-square values. These values describe the proportion of variance in the endogenous constructs that can be explained by the independent and intervening variables in the model. The R-square results are shown in Table 6.

Table 6. R-Square Test

Construct	R-Square
E-Government Application Innovation (X)	0.885
Increasing Public Trust (Y1)	0.864
Increasing Citizen Engagement (Y2)	0.872
E-Government Effectiveness (Z)	0.855

Source: Data processed with PLS 3.0, 2023.

The R-square value for increasing public trust is 0.864, indicating that 86.4% of the variation in public trust can be explained by E-Government application innovation and E-Government effectiveness. Meanwhile, the R-square value for increasing citizen engagement is 0.872, meaning that 87.2% of the variation in citizen engagement can be explained by the same variables. The remaining variance is explained by other factors outside the scope of this study.

4.1.6. Hypothesis Testing

Hypothesis testing was conducted using bootstrapping results. The decision to accept a hypothesis was based on the T-statistics and P-values. The results of the hypothesis testing are presented in Table 7, and the comparative strength of the T-statistics is visualized in Figure 3.

Table 7. Hypothesis Testing Results

Hypothesis	Effect	T-Statistics	P-Value	Result
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H1	E-Government application innovation → increasing public trust	5.411	0.001	Accepted
H2	E-Government application innovation → increasing citizen engagement	6.524	<0.001	Accepted
H3	E-Government application innovation → E-Government effectiveness	4.542	0.002	Accepted
H4	E-Government effectiveness → increasing public trust	5.232	<0.001	Accepted
H5	E-Government effectiveness → increasing citizen engagement	6.222	0.001	Accepted
H6	E-Government application innovation → increasing public trust through E-Government effectiveness as an intervening variable	4.443	0.002	Accepted
H7	E-Government application innovation → increasing citizen engagement through E-Government effectiveness as an intervening variable	3.761	<0.001	Accepted

Source: Data processed with PLS 3.0, 2023.

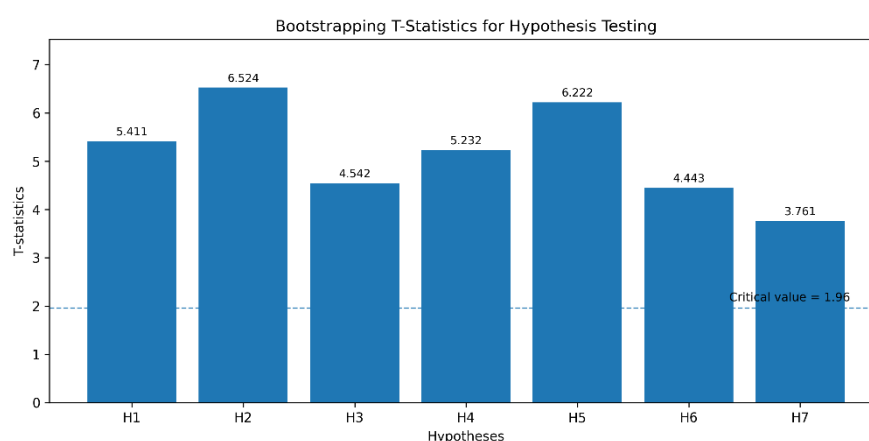


Figure 3. Bootstrapping T-Statistics for Hypothesis Testing

Source: Processed by the author based on PLS bootstrapping results, 2023.

The results indicate that all proposed hypotheses are accepted. E-Government application innovation has a significant effect on increasing public trust, increasing citizen engagement, and improving E-Government effectiveness. Furthermore, E-Government effectiveness has a significant effect on both public trust and citizen engagement. The indirect-effect results also show that E-Government application innovation influences public trust and citizen engagement through E-Government effectiveness as an intervening variable.

4.2. Discussion

4.2.1. The Effect of E-Government Application Innovation on Public Trust

The findings show that E-Government application innovation has a significant effect on increasing public trust. This means that the more innovative the E-Government platform, the greater the opportunity for citizens to perceive government services as accessible, responsive, and reliable. Innovation in digital public service applications can reduce bureaucratic complexity, improve the speed of service delivery, and strengthen citizens' confidence in the ability of the local government to respond to public needs. This finding is consistent with Nookhao and Kiattisin (2023), who found that creative and citizen-oriented E-Government platforms can strengthen the closeness between government and society.

4.2.2. The Effect of E-Government Application Innovation on Citizen Engagement

The study also confirms that E-Government application innovation significantly influences increasing citizen engagement. Innovative digital platforms provide citizens with more opportunities to access information, submit feedback, participate in service evaluation, and communicate with the government. When E-Government applications are designed to be practical, inclusive, and easy to use, citizens are more likely to participate in public service processes. This finding supports Nookhao and Kiattisin (2023), who stated that more innovative E-Government service platforms tend to be closer to citizens and generate higher public involvement.

4.2.3. The Effect of E-Government Application Innovation on E-Government Effectiveness

The findings indicate that E-Government application innovation has a significant effect on E-Government effectiveness. Innovation is an important driver of effective digital services because it allows the government to improve service features, simplify procedures, integrate service channels, and respond more quickly to citizens' needs. Well-designed innovation can transform E-Government from a merely administrative digital tool into a more responsive public service system. This result is in line with Khan, Sohrab (2020), who emphasized that effective E-Government services are developed through carefully designed innovation.

4.2.4. The Effect of E-Government Effectiveness on Public Trust

The results further demonstrate that E-Government effectiveness has a significant effect on increasing public trust. Effective digital services can strengthen public confidence because they make government services faster, clearer, and easier to access. When citizens experience service processes that are transparent, responsive, and not complicated by government apparatuses, they are more likely to trust the government's performance. This finding is supported by Lee et al. (2020), who found that the effectiveness of E-Government services can improve public trust in government performance.

4.2.5. The Effect of E-Government Effectiveness on Citizen Engagement

The findings show that E-Government effectiveness contributes significantly to increasing citizen engagement. Effective E-Government can reach more citizens, provide more accessible service channels, and create opportunities for the public to participate in improving service performance. When citizens perceive that digital services are useful, timely, and responsive, their willingness to participate in public service activities tends to increase. This result is consistent with Chen and Tao (2021), who showed that E-Government effectiveness is closely related to the ability to reach wider communities and encourage higher public participation.

4.2.6. The Indirect Effect of E-Government Application Innovation on Public Trust through E-Government Effectiveness

The results reveal that E-Government application innovation influences increasing public trust through E-Government effectiveness as an intervening variable. This indicates that innovation alone is not sufficient unless it is implemented effectively in public service delivery. When innovation improves the effectiveness of E-Government services, citizens are more likely to perceive the government as capable, responsive, and trustworthy. This finding is consistent with Guo, Yue, Chen, Jidong, and Liu (2022), who showed that stronger innovation in E-Government is closely related to the effectiveness of digital service use and the improvement of public trust.

4.2.7. The Indirect Effect of E-Government Application Innovation on Citizen Engagement through E-Government Effectiveness



Finally, the study confirms that E-Government application innovation has a significant effect on increasing citizen engagement through E-Government effectiveness as an intervening variable. Innovative applications can improve service effectiveness by making digital services more accessible, interactive, and responsive to citizens' needs. In turn, this effectiveness encourages citizens to participate more actively in supporting and using E-Government services. This finding supports Yuan, Yun Peng (2023), who stated that increasing innovation in E-Government applications can improve service effectiveness and encourage stronger citizen participation in E-Government service delivery.

4.2.8. Summary of Findings

Table 7. Summary of Research Findings

Research Relationship	Empirical Result	Interpretation
Innovation → Public Trust	Significant	Innovative applications strengthen public confidence in government services.
Innovation → Citizen Engagement	Significant	More innovative platforms encourage citizens to participate in public service processes.
Innovation → E-Government Effectiveness	Significant	Innovation improves the performance and usability of E-Government services.
Effectiveness → Public Trust	Significant	Effective services increase citizens' trust in government performance.
Effectiveness → Citizen Engagement	Significant	Effective services expand opportunities for public participation.
Innovation → Public Trust through Effectiveness	Significant	Effectiveness strengthens the role of innovation in building trust.
Innovation → Citizen Engagement through Effectiveness	Significant	Effectiveness strengthens the role of innovation in increasing engagement.

5. Conclusion

The findings of this study demonstrate that E-Government application innovation has a significant influence on public trust, citizen engagement, and E-Government effectiveness in Medan City. E-Government effectiveness also significantly influences public trust and citizen engagement. In addition, E-Government effectiveness acts as an intervening variable that strengthens the influence of E-Government application innovation on both governance outcomes. These results confirm that digital public service innovation becomes more meaningful when it improves the effectiveness of service delivery. The study concludes that application innovation should not be limited to the existence of digital platforms. It must be reflected in service availability, accessibility, user satisfaction, transparency, operational efficiency, and public participation. When these dimensions are implemented effectively, citizens are more likely to perceive government services as reliable, responsive, accountable, and worthy of trust. Effective E-Government also encourages citizens to engage more actively by enabling them to access information, submit feedback, participate in service evaluation, and communicate with public institutions. Theoretically, this study contributes contextual evidence from Medan City by showing that the relationship between E-Government innovation and governance outcomes is mediated by perceived service effectiveness. Practically, the Medan City Government should strengthen integrated digital service platforms, simplify online procedures, improve response speed, expand feedback channels, and ensure that citizens with different educational and digital-literacy backgrounds can use E-Government services easily. Because this study used 100 respondents, the findings should be interpreted carefully. Future research should involve a larger sample, include more diverse demographic groups, and compare different public service sectors or districts to strengthen the generalizability of the results.

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