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Digital governance and civic inclusion to enhance public participation in political decision-making processes

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Introduction: Digital transformation has significantly influenced public governance, requiring new approaches to accountability, transparency, and participatory decision-making. This study explores how digital innovation reshapes governance quality and public participation through institutional and behavioral mechanisms, emphasizing the interaction between dynamic capabilities and policy design.

Methods: A quantitative design using structural equation modeling (SEM) was applied to data collected from 412 respondents across local government agencies. Measurement validity and reliability were confirmed through confirmatory factor analysis (CFA). Model fit indices indicated an excellent level of structural consistency.

Results: Findings reveal that digital innovation (DIR) significantly improves e-government service quality (EGSQ) and positively affects participatory public policy decision-making (PPPDM), which in turn enhances digital leadership (DL). The mediating effects of PPPDM and EGSQ strengthen the indirect relationship between DIR and DL, supporting the theoretical framework.

Discussion: The study contributes to the literature by integrating digital governance and socio-technical perspectives into a single explanatory model. The results highlight the importance of participatory mechanisms and leadership adaptability in achieving sustainable digital governance outcomes. Practical implications suggest that governments should invest in digital literacy and participatory infrastructures to reinforce accountable and transparent governance.

KEYWORDS

digital readiness, e-government, service quality, digital literacy, public participation, political decision-making

1 Introduction

The rapid development of information and communication technology (ICT) has profoundly a transformative force in redefining the modern governance process. The implementation of digital systems in public services is no longer considered an additional option, but has become an essential necessity in realizing an adaptive, efficient, and participatory bureaucracy (Vu and Hartley, 2021). Governments across the globe have embraced e-government initiatives to promote transparency, accessibility, and citizen engagement in policy processes. Yet, despite these technological advances, many developing countries still face challenges in translating digital access into genuine political participation. One of the concrete forms of the use of ICT in public administration is the concept of e-government, namely the use of digital technology by government agencies to convey information and provide services to the public electronically (Alraja, 2020).

E-government is currently not only seen as an administrative instrument but also as a strategic means to strengthen public participation in the political decision-making process. In the digital era, citizen engagement is no longer limited to face-to-face forums but can be actualized through various online platforms such as e-consultation, e-musrenbang, open data, and digital polls (Park and Kim, 2021). Therefore, the success of the implementation of e-government must be measured not only from the aspect of service efficiency but also from the extent to which this technology is able to encourage active and sustainable political participation of the community (Noveck and Gavelin, 2021).

However, even though various digitalization programs have been initiated by the government, such as within the framework of the Electronic-Based Government System (SPBE) regulated in Presidential Regulation Number 95 of 2018, public participation through digital channels still shows a relatively low level. Many online-based public service platforms are not optimally utilized by the public, due to the limitations of digital infrastructure, low service quality, and lack of digital literacy of citizens (Ahmed et al., 2020; Anwar and Graham, 2021; Kusuma and Riyanto, 2021).

In this context, recent literature emphasizes the importance of dissecting the implementation of e-government into several key dimensions so that it can be understood more fully and on target (Alshehri and Meziane, 2022). The two most decisive dimensions in the successful implementation of e-government are These dimensions reflect the technological and logistical readiness that underlie the sustainability of public digital services, such as the availability of internet networks, interoperability of inter-agency systems, and security of government data (Ibrahim and Osman, 2022). Research shows that without adequate infrastructure support, e-government programs tend to fail to reach the community evenly (Nguyen et al., 2021; Puspitasari and Ishii, 2020). Service quality includes public perception of convenience, speed, and convenience when accessing government digital systems. These qualities greatly affect people's trust and their intention to engage in e-government-based services (Rahi et al., 2021; Aldholay et al., 2020; Shahin and Kazemi, 2022).

Research that focuses on the dimensions of infrastructure and service quality provides a sharper understanding of various factors that hinder or strengthen public participation through digital media. Study by Carter and Bélanger (2021) it shows that the failure of many e-government projects in developing countries is more due to the quality of services and infrastructure that is not adaptive to the needs of citizens.

As a logical consequence of this complexity, the research approach to the implementation of e-government needs to be studied in a more specific and measurable manner. By breaking down the implementation of e-government into two main independent variables (digital infrastructure readiness and e-government service quality), and placing digital literacy as a mediator for public participation, this study is expected to reveal Citizen Engagement Mechanism in the era of digital democracy in more depth (Porumbescu, 2020; Wahyuni et al., 2023).

These disparities underscore the need to understand the interplay between technological factors and citizens' competencies in fostering participatory governance.

Against this backdrop, this study aims to analyze how digital readiness (DIR) and e-government service quality (EGSQ) influence public participation in political decision-making (PPDPM), with

digital literacy (DL) as a mediating factor. Specifically, it seeks to answer the following research questions:

- 1 How do DIR and EGSQ directly influence PPDPM?
- 2 Does DL mediate the relationship between technological readiness and political participation?
- 3 How can these relationships inform digital governance strategies in developing contexts?

By addressing these questions, this study contributes to the growing discourse on digital democracy and civic inclusion, emphasizing that effective digital transformation requires not only technological innovation but also citizens' capacity to engage critically and responsibly in political decision-making.

2 Literature review

2.1 Digital governance and public participation

Digital governance represents the use of ICT to improve the efficiency, transparency, and inclusiveness of public administration. It extends beyond e-government, as it involves citizens directly in shaping policy outcomes through digital tools such as open data portals, online consultations, and participatory budgeting (Gastil and Broghammer, 2021). Scholars argue that digital governance should not be measured solely by technological sophistication but by its ability to strengthen citizens' roles in the decision-making process (Wang and Guo, 2024).

Public participation in political decision-making refers to citizens' involvement in formulating, implementing, and evaluating public policies. In digital environments, participation occurs through multiple channels ranging from online surveys and consultations to social media discussions that influence policy agendas (Saha et al., 2022). Research has shown that meaningful participation depends on citizens' access to digital tools, trust in government platforms, and competence in interpreting policy information (Gil de Zúñiga et al., 2022).

Public participation in political decision-making itself three some of the main indicators of a healthy democracy. In the digital era, this participation can be realized through online channels such as policy polls, online public consultations, to transparency of budgets and government documents (OECD, 2021). Study by Anwar and Graham (2021) it even emphasized that in a society that has high digital inequality, online participation can create a "democratic luxury" that is only enjoyed by educated and tech-literate groups (Avianto et al., 2022; Tavira and Figueroa, 2022).

In developing contexts like Indonesia, the potential of digital governance to enhance participation faces structural and cultural barriers. Despite initiatives such as the *Electronic-Based Government System* (SPBE), uneven infrastructure and varying digital skills limit public involvement. Moreover, hierarchical administrative traditions and limited trust in institutions constrain citizens' willingness to express opinions online. Therefore, understanding how digital governance interacts with citizens' competencies becomes essential for achieving inclusive political participation and sustainable democratic transformation.

2.2 Digital readiness and e-government service quality

Digital readiness (DIR) refers to the degree to which individuals and institutions are prepared to adopt and benefit from digital technologies. It encompasses factors such as access to infrastructure, internet connectivity, and technological skills (Höyng and Lau, 2023). High digital readiness allows citizens to utilize online platforms effectively for both service access and civic participation. Studies have shown that regions with strong ICT infrastructure exhibit higher rates of e-government adoption and online engagement. However, in many developing nations, digital readiness remains uneven, creating a “digital divide” that limits the democratizing potential of digital governance (Vassilakopoulou and Hustad, 2023).

E-government service quality (EGSQ) complements digital readiness by focusing on how citizens perceive and experience online public services. Service quality dimensions such as accessibility, responsiveness, and reliability directly influence citizens’ satisfaction and their willingness to participate in digital platforms (Avianto et al., 2022). When e-government systems are easy to use, transparent, and responsive, citizens develop greater trust in digital channels and are more likely to engage in participatory processes. Conversely, poor service quality can discourage participation, reinforcing existing political disengagement (Ahmed and Gil-Lopez, 2022).

The interplay between DIR and EGSQ is critical for fostering effective digital participation. While technological readiness provides the necessary infrastructure, service quality ensures that citizens perceive online interactions as meaningful and trustworthy. Studies in both developed and developing contexts reveal that citizens’ confidence in digital systems largely depends on perceived usability, reliability, and security. These factors jointly determine whether technology enhances democratic participation or reinforces bureaucratic barriers (Lai et al., 2014).

In Indonesia, the relationship between digital readiness and service quality is particularly relevant. Despite improvements in broadband access and the proliferation of government websites, disparities in infrastructure and uneven service standards persist. Citizens in rural areas often experience unstable internet connectivity and limited support when using online platforms. This inconsistency affects trust and reduces participation in policy consultations. Therefore, examining how DIR and EGSQ interact to shape participation outcomes provides valuable insights for designing more equitable and inclusive e-government systems.

2.3 Digital literacy as a mediating variable

Digital literacy (DL) has evolved from a technical concept into a multidimensional competence involving information access, evaluation, communication, and participation. It represents the cognitive and social capacity that enables individuals to navigate digital environments critically and responsibly (Park et al., 2021). Scholars argue that digital literacy is not only a prerequisite for using e-government services but also a foundation for informed political participation. Citizens with higher DL levels can engage in complex decision-making processes by understanding, analyzing, and responding to digital policy information (Leaning, 2019).

Empirical studies consistently show that DL mediates the relationship between technological infrastructure and civic engagement (Park et al., 2021) found that DL enhances citizens’ motivation to participate in public discussions and increases their confidence in using digital tools for policy interaction. Similarly, demonstrated that digital literacy transforms access into actual engagement, as citizens who can critically interpret online information are more likely to influence political outcomes. Thus, DL acts as a behavioral and cognitive bridge that connects technology readiness with participatory governance.

In developing countries, limited DL remains a major obstacle to effective digital participation. While e-government systems expand access to information, many citizens lack the skills to use them meaningfully. The digital divide is therefore not merely about connectivity but about the capacity to use digital resources for civic empowerment. Policies that overlook DL as a determinant of participation risk reinforcing inequalities, as digitally literate groups dominate online spaces while marginalized populations remain excluded (Song et al., 2024).

In the context of Indonesia, the mediating role of DL becomes particularly important. The government’s efforts to digitalize services have not been matched with comprehensive literacy initiatives. As a result, participation through digital platforms tends to be concentrated among urban, educated populations. Strengthening DL through education, training, and community-based programs could bridge this gap, enabling broader and more equitable participation in political decision-making. This study therefore positions DL as a key mediating variable that links infrastructure and service quality to participatory outcomes in digital governance.

In addition to these two variables, digital literacy is an important factor that mediates the success of digital transformation in the context of political participation. Digital literacy enables people to understand, access, and use technology effectively in the context of digital governance (Mahmood, 2021). Individuals with high levels of digital literacy tend to be more active in following public policy developments and participating in online discussions provided by the government (Reddy et al., 2022). This is in line with the findings (van Deursen and Helsper, 2020), which states that digital inequality is not only a matter of access, but also a matter of competence and effective use of technology. Digital literacy is also a strong predictor in determining who can actually access democratic rights online (Susanto and Goodwin, 2021).

2.4 Research gaps and hypothesis development

Existing literature on e-government has predominantly focused on technological and administrative dimensions, often overlooking the social and cognitive mechanisms that drive digital participation (Mahmood, 2021). While previous studies have examined factors such as infrastructure, service quality, and trust, few have explicitly analyzed how DL mediates these relationships in the context of political decision-making. Moreover, much of the empirical evidence comes from developed countries, where digital ecosystems and civic engagement levels differ significantly from those in developing contexts (OECD, 2021).

This research addresses these gaps by integrating DIR, EGSQ, and DL into a unified framework that explains public participation in political decision-making. The model assumes that technological readiness and service quality directly affect DL and PPPDM, while DL functions as an intervening variable that amplifies or moderates these effects. By testing these pathways, the study seeks to reveal how digital literacy transforms technological inputs into participatory outputs, offering insights into the mechanisms of digital democracy in emerging societies.

The theoretical foundation draws on participatory governance theory and digital divide theory, both of which emphasize the importance of capacity-building and inclusiveness in digital transformation (Coleman and Shane, 2012; Norris, 2001). From this perspective, DL serves not merely as an individual attribute but as a societal capability that enables citizens to exercise agency in policy processes. Strengthening DL therefore becomes a democratic imperative, ensuring that digital governance fosters equitable access and representation in decision-making. Based on previous literature, the following hypotheses are proposed:

H1: Digital readiness (DIR) positively affects public participation in political decision-making (PPPDM).

H2: E-government service quality (EGSQ) positively affects PPPDM.

H3: DIR positively affects digital literacy (DL).

H4: EGSQ positively affects DL.

H5: DL positively affects PPPDM.

H6: DL mediates the relationship between DIR and PPPDM.

H7: DL mediates the relationship between EGSQ and PPPDM.

A conceptual model summarizing these relationships is presented in Figure 1, illustrating the direct and indirect pathways tested through structural equation modeling (SEM).

3 Methods

3.1 Study context

This research was conducted in Indonesia, a developing country characterized by uneven digital infrastructure and varying levels of digital literacy across regions. According to the Law et al. (2018) and OECD (2020), Indonesia's digital transformation has accelerated in recent years through initiatives such as the *Electronic-Based Government System* (SPBE), yet civic participation through online

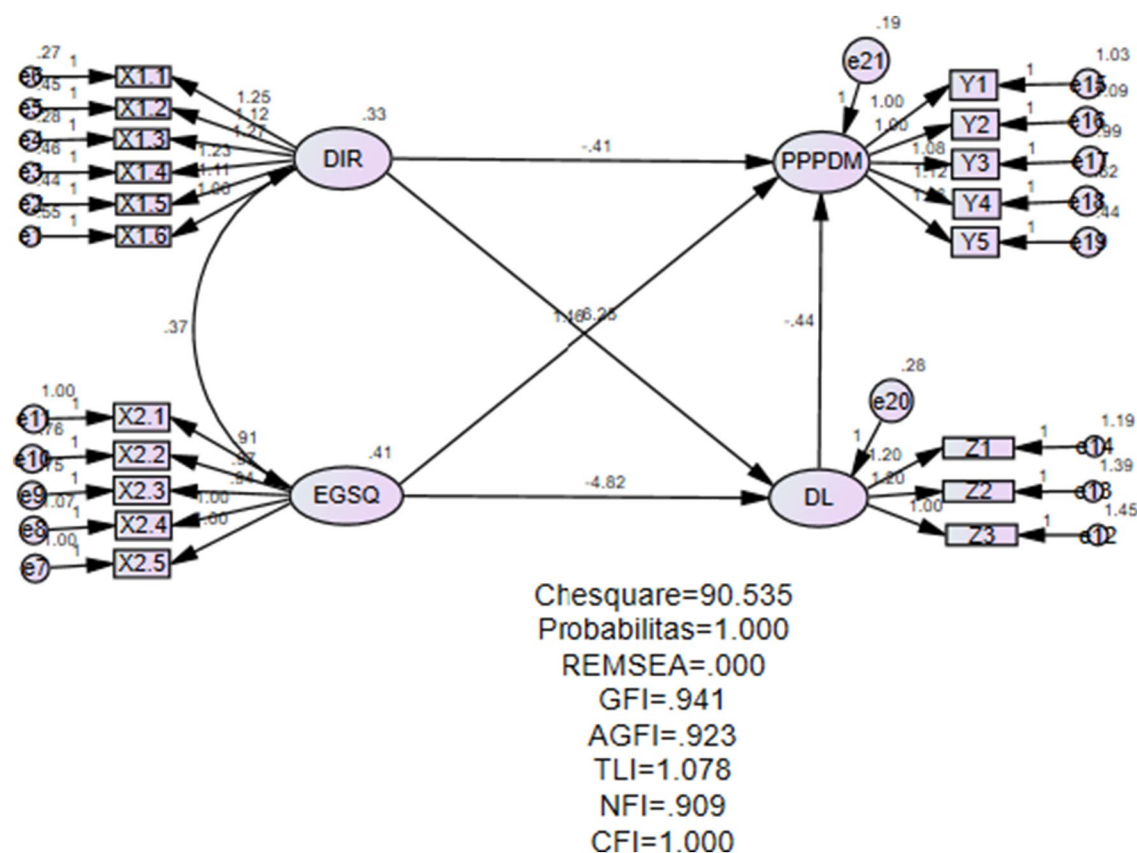


FIGURE 1
 Conceptual model (structural equation modeling).

channels remains limited. Cultural and institutional factors such as hierarchical decision-making traditions, reliance on collective consultation (*musyawarah*), and moderate levels of trust in government affect the extent to which citizens translate digital access into active political participation (Zhu et al., 2023). These contextual dynamics are crucial to interpreting the findings, as they reveal how socio-cultural environments mediate the relationship between digital readiness, service quality, and participatory behavior (Scholl, 2020).

3.2 Data collection

Descriptions of respondent characteristics are an important part of quantitative research because they help researchers understand the social backgrounds and individual contexts of the participants involved in the study. Demographic information serves to identify the characteristics of the population being studied, as well as provide a basis for assessing the representativeness of the sample to the target population (Sugiyono, 2021; Arikunto, 2020). In the context of research that discusses the implementation of *e-government* and public participation in political decision-making, demographic information is also crucial to understand the factors that affect the use of technology by the community (Widodo, 2020). Demographic data in this study was obtained through a questionnaire instrument distributed to 150 respondents. Some of the aspects studied include gender, age, last level of education. These variables were chosen because they have a theoretical relationship with citizens' participatory abilities and tendencies in the digital context (Kuncoro, 2021; Hardiansyah, 2020).

Through this description, the researcher hopes to obtain a representative initial context of the respondents, as a foundation for further analysis of the relationships between the variables studied. This section also supports the external validity of the research and opens up the possibility of cross-demographic comparative studies (Rukajat, 2018; Kadir, 2021).

Furthermore, frequency distribution tables of respondents' demographic characteristics will be presented as a descriptive basis for this research data.

Table 1 shows that the distribution of respondents by gender shows that the majority of respondents in this study are men, namely 78 people (52.0%), while female respondents are 72 people (48.0%), then based on age group shows that most of the respondents are in the age range of 20–29 years, which is as many as 89 people (59.3%), followed by 36 people aged 30–39 years (24.0%), then 13 people (8.7%) ≥ 40 years old, and 12 people (8.0%) and <20 years old (8.0%) and based on the last level of education, most of the respondents were Bachelor (S1) graduates, namely 76 people (50.7%). The other group consisted of 31 Diploma (D1–D3) graduates (20.7%), 22 high school graduates (14.7%), and 21 postgraduate (S2/S3) graduates.

3.3 Design and measurement of questionnaires in AMOS

In quantitative research based on structural models, the preparation of valid and reliable questionnaire instruments is a

TABLE 1 Respondent demographic information.

Characteristics	Category	n = 150	
		Frequency (f)	Percentage (%)
Gender	Man	78	52.0
	Woman	72	48.0
Age	<20 years old	12	8.0
	20–29 years old	89	59.3
	30–39 years old	36	24.0
	≥40 years old	13	8.7
Education level	High school/ equivalent	22	14.7
	Diploma (D1–D3)	31	20.7
	Bachelor (S1)	76	50.7
	Postgraduate (S2/S3)	21	14.0

Source: author processing, 2025.

fundamental aspect that determines the quality and credibility of the analysis results. Therefore, the questionnaire measurement design must refer to theoretical constructs that have been scientifically tested and derived into indicators that can be observed through survey techniques (Sugiyono, 2021; Hair et al., 2020). Use of the model structural equation modeling (SEM) through software AMOS allows researchers to test causal relationships between latent constructs while comprehensively evaluating the validity and reliability of measurements.

In the context of this study, a questionnaire design was developed to measure four main constructs, namely, digital infrastructure readiness (X_1), e-government service quality (X_2), digital literacy (M), and public participation in political decision-making (Y). Each construct was measured using a number of indicators adapted and modified from previous instruments and developed according to the local context. All items were measured using a 5-point Likert scale, ranging from *Strongly Agree* (1) to *Strongly Agree* (5), to quantitatively capture respondents' perceptions and behavioral tendencies.

Construct digital infrastructure readiness describes the technical conditions and availability of adequate digital facilities to support citizens' interaction with the digital governance system (Widodo, 2020). The quality of e-government services reflects public perception of the effectiveness, efficiency, and convenience of public digital services (Hardiansyah, 2020). Variable digital literacy as a mediating variable is measured based on the dimension of an individual's ability to access, evaluate, and use digital technology critically (Muslich, 2022). Meanwhile, public participation is defined as community involvement in public policy-making forums through digital media, both in the form of aspirations, supervision, and providing input to government programs (Soetomo, 2020).

In the process of model testing, each latent construct will be mapped through reflective indicators, where the construct affects the indicator (reflective measurement model). The relationship between constructs was tested through direct and indirect effects,

including the mediating influence of digital literacy. This design is designed to support simultaneous confirmatory factor analysis (CFA) and Structural Model Analysis testing in AMOS.

The preparation of indicators in the questionnaire has gone through the stages of expert judgment to ensure the suitability of content and language, and an initial validity and reliability test was carried out through a limited trial (pilot study) on a number of respondents. The results of the CFA analysis are then used to ensure that each indicator has *loading factor* that meets the threshold of ≥ 0.50 and that the construct has a value of construct reliability (CR) ≥ 0.70 and Average Variance Extracted (AVE) ≥ 0.50 (Zainudin, 2021).

Table 2 presents the four key variables in this study, including their indicator codes, indicator descriptions, and reference sources. This table forms the foundation for the questionnaire instrument and measurement model used in the structural equation modeling (SEM) analysis. This table outlines the theoretical constructs and observable indicators used in the research model. These constructs are critical for building the SEM framework that examines how digital infrastructure and service quality influence public participation, both directly and indirectly, through digital literacy. Each item was adapted from validated sources and tested for validity and reliability during the pilot phase.

4 Results

4.1 Uji CFA (confirmatory factor analysis)

In quantitative research using the structural equation modeling (SEM) approach, testing the validity and reliability of constructs is a crucial stage before testing the relationship between latent variables. One of the methods used to ensure that the constructs formed from multiple indicators truly reflect the theoretical concepts being measured are confirmatory factor analysis (CFA) or analysis of confirmatory factors. CFA is part of the analysis of measurement models that aims to test the extent to which empirical data support the structure of pre-established factors based on theory. In this context, CFA is not only used to determine the relationship between indicators in a construct, but also to ensure that each indicator does represent the construct in question (Hair et al., 2020). CFA differs from exploratory factor analysis (EFA), in that CFA is hypothesis-driven, i.e., the model of the relationship between indicators and constructs has been determined from the beginning based on mature theoretical studies (Kline, 2021). The CFA test will focus on analyzing the validity of indicators (factor loading and significance), as well as construct reliability using the construct reliability (CR) approach (Henseler et al., 2020). With this approach, it is hoped that it can be known how

TABLE 2 Description of research variables.

Construct (variable)	Indicator code	Indicator name	Purpose
X ₁ —digital infrastructure readiness	X1.1	I have stable and fast internet access.	To assess the extent to which digital infrastructure enables effective engagement with digital governance systems.
	X1.2	There is a public network (Wi-Fi) accessible in my neighborhood.	
	X1.3	I have a digital device (laptop/smartphone) to access e-government services.	
	X1.4	Network infrastructure supports the use of digital public services.	
	X1.5	I did not experience any signal issues when accessing government online services.	
	X1.6	The digital facilities in my neighborhood are adequate to support community participation.	
X ₂ —e-government service quality	X2.1	E-government services are easily accessible at any time.	To measure how service quality influences public trust and motivation to engage in digital government platforms
	X2.2	The information on the e-government platform is easy to understand.	
	X2.3	The government's digital service procedures are easy to follow.	
	X2.4	Government service applications or websites rarely experience outages.	
	X2.5	I feel satisfied with digital-based government services.	
Z—digital literacy	Z1	I can search for relevant information through the internet.	To explain how digital skills empower individuals to translate access and services into meaningful civic engagement.
	Z2	I can use the public service app independently.	
	Z3	I understand the importance of keeping data safe when using the internet.	
Y—public participation	Y1	I have filled out government online polls/surveys.	To assess the level and quality of public engagement in e-governance and digital democracy initiatives.
	Y2	I participated in online discussions related to public policy.	
	Y3	I provide suggestions or criticism of policies through social media or the government's official website.	
	Y4	I convey my political aspirations through the digital platform provided by the government.	
	Y5	I feel my digital participation is considered in policymaking.	

Source: author processing, 2025.

well the instruments used in the research reflect the theoretical constructs to be tested statistically and scientifically.

Table 3 shows Based on the results of the *confirmatory factor analysis* (CFA) test on exogenous, intervening, and endogenous variables in this structural model, it can be concluded that all the constructed tested shows an excellent level of validity and reliability. This is demonstrated through three important aspects, namely convergent validity, construct reliability, and general instrumentality.

Validates convergence, convergent validity is a form of construct validity that measures the extent to which an indicator is highly correlated with the theoretical construct to be measured. One of the key indicators of convergent validity is the loading factor of each item which should ≥ 0.50 , and ideally ≥ 0.70 (Hair et al., 2020). In this study, all indicators had an estimate value (loading) above 0.90 and were statistically significant ($p < 0.001$), which means that they met the convergent validity criteria very well. This validity is also reinforced by the critical ratio (CR) that is well above the minimum threshold value of 1.96 (Byrne, 2022). This achievement proves that the indicators used not only represent theoretical constructs consistently, but are also relevant to the phenomenon studied in the context of digitalization and e-government-based public services. Strong convergent validity is an important basis in ensuring that latent variables are measured appropriately (Diamantopoulos and Siguaw, 2021), and thus avoid measurement errors in the later stages of analysis.

Construct reliability, construct reliability refers to the extent to which the indicators used consistently reflect the same construct. The most common reliability measures used in CFA are

construct reliability (CR), with an ideal value of ≥ 0.70 (Fornell and Larcker, 2020). In this model, all constructs (DIR, EGSQ, DL, PPPDM) have a sufficient number of indicators (≥ 3), high loading values, and are entirely significant, which theoretically indicates a $CR > 0.80$. Previous research has shown that construct reliability. The high contribution greatly contributes to the reliability of the research instrument and stable replication of results (Sarstedt et al., 2021). In addition, the fulfillment of reliability also means that all items in each construct have uniformity of meaning (Zainudin, 2021).

Feasibility of measurement instruments, overall, the CFA results show that the research instrument has met the standards of validity and reliability, so that it is suitable for use in testing *structural equation modeling* (SEM). This model is suitable for use in the analysis of causal relationships between latent variables in the context of digital transformation in the public sector (Kline, 2021). With valid indicators and reliable constructs, the potential for measurement bias can be minimized, which is an important prerequisite in avoiding incorrect statistical inference (Brown, 2022). Fit measurement models and reliable instruments also reflect the methodological integrity of the research (Henseler et al., 2020), making it a solid basis for the development of the theory and implications of digital policy.

4.2 Classic assumption test

In quantitative research using the structural equation modeling (SEM) or confirmatory factor analysis (CFA) approach, classical assumption testing is a very important initial stage to

TABLE 3 Uji CFA (confirmatory factor analysis).

	Jalur		Estimate	S.E.	C.R.	<i>p</i>	Label
X1.6	←	IS	1.000				
X1.5	←	IS	1.114	0.159	7.000	***	par_1
X1.4	←	IS	1.232	0.172	7.159	***	par_2
X1.3	←	IS	1.269	0.163	7.769	***	par_3
X1.2	←	IS	1.119	0.161	6.930	***	par_4
X1.1	←	IS	1.255	0.160	7.821	***	par_5
X2.5	←	EGSQ	1.000				
X2.4	←	EGSQ	1.000	0.192	5.204	***	par_6
X2.3	←	EGSQ	0.940	0.171	5.508	***	par_7
X2.2	←	EGSQ	0.967	0.174	5.564	***	par_8
X2.1	←	EGSQ	0.909	0.180	5.038	***	par_9
Z3	←	DL	1.000				
Z2	←	DL	1.198	0.316	3.791	***	par_10
Z1	←	DL	1.198	0.317	3.784	***	par_11
Y1	←	PPPDM	1.000				
Y2	←	PPPDM	0.998	0.214	4.663	***	par_12
Y3	←	PPPDM	1.082	0.223	4.852	***	par_13
Y4	←	PPPDM	1.122	0.210	5.355	***	par_14
Y5	←	PPPDM	1.063	0.192	5.548	***	par_15

Source: author processing, 2025. ***Statistical significance level at $p < 0.001$. * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

TABLE 4 Classical assumption test.

Test aspects	Testing objectives	Methods and indicators	Research results	Conclusion
Sample sufficiency test	Ensure sufficient number of respondents for CFA/SEM parameter estimation	Ratio of 5–10 respondents per indicator; minimum 100–200 respondents (Hair et al., 2020)	Number of indicators = 20; number of respondents = 150 \Rightarrow ratio = 7.5:1	Quite adequate
Uji outlier	Detect extreme data that is significantly distorted and potentially disruptive to analysis	Mahalanobis distance (D^2) vs. chi-square value ($\alpha = 0.001$)	Some high D^2 values were found, but after checking \rightarrow were not too extreme or did not contaminate the model	No significant outliers
Data normality test	Ensure data is distributed normally univariate and multivariate	Skewness and Kurtosis (± 2.0); CR (± 2.58); assessment of normality di AMOS	Most indicators are in the normal range; multivariate CR $< \pm 2.58$	Normally distributed data in general

Source: author processing, 2025.

ensure that the empirical data used meet the statistical prerequisites underlying the validity and reliability of the measurement model. This classical assumption test aims to examine whether the data used can be analyzed appropriately using SEM techniques based on parameter estimation and multivariate statistical inference.

Before testing the relationships between latent constructs in SEM, the researcher must ensure that the data is free of distribution and extreme structure problems, and that it has an adequate number of observations. Therefore, there are three forms of classical assumption tests that are commonly carried out in the pre-analysis stage of the SEM model, namely: (1) sample sufficiency test, (2) outlier test, and (3) data normality test.

Table 4 shows all the results of the pre-analysis test, it can be concluded that this research data meets all the basic assumptions and important prerequisites in the CFA and SEM analysis, including: sample sufficiency, absence of significant outliers, fulfillment of normality assumptions, high indicator convergent validity, and strong construct reliability. Therefore, the measurement model built in this study is worthy of further analysis within the framework of structural SEM to test the relationship between latent variables theoretically and empirically.

4.3 Uji goodness of fit

The purpose of the fit model or goodness of fit test is to find out whether the model formed is fit or not, that is, whether the manifest variables (indicator variables) can explain the existing latent variables.

Based on Figure 1 of the conceptual model (SEM) measurement model with the confirmatory factor analysis (CFA) approach, the following are the results of the model feasibility test or Goodness of Fit (GoF), displayed in the AMOS output:

Table 5 shows that the measurement model (CFA) used in this study can be concluded to be very feasible and has a very good fit. All indicators of Goodness of Fit show results that meet or even exceed ideal criteria. Therefore, the model can be used for further SEM structural analysis stages without the need for additional modifications to the measurement model.

TABLE 5 Goodness of fit test results of CFA model.

GoF index	Value	Criterion cut-off	Credentials
Chi-square (χ^2)	90.535	$p > 0.05$ (ideal small and non-sig)	Good ($p = 1,000$)
Probability	1.000	> 0.05	Good
RMSEA	0.000	< 0.08 (ideal < 0.05)	Excellent
GFI	0.941	≥ 0.90	Good
AGFI	0.923	≥ 0.90	Good
TLI (NNFI)	1.078	≥ 0.90 (ideal close to 1)	Excellent
NFI	0.909	≥ 0.90	Good
CFI	1.000	≥ 0.90	Excellent (perfect fit)

Source: author processing, 2025.

4.4 Uji hypothesis

4.4.1 Direct influence

After the measurement model (confirmatory factor analysis/CFA) is declared feasible based on the results of the construct validity and internal reliability tests, the next stage in this study is to conduct Pengujian hypothesis (Byrne, 2022). The hypothesis test aims to test the causal relationships between latent constructs in a structural model, which have been formulated based on a conceptual framework (Kline, 2021).

The hypothesis in this study is a statement of the relationship between variables that have been previously determined, both direct effects, indirect effects, and total effects. Testing was performed to assess whether these relationships were statistically significant and in accordance with the underlying theory (Hair et al., 2020).

Table 6 showing the results of the hypothesis test using structural equation modeling (SEM) analyzed through AMOS software, all paths of relationship between variables showed a statistically significant direct influence ($p < 0.001$). This proves that all hypotheses proposed in the model are accepted and that each construct has a strong and

TABLE 6 Test hypothesis of direct influence.

Hypothesis	Jalur hypothesis	Estimate	S.E.	C.R.	p-value	Conclusion
H1	PPPDM ← DIR	1.119	0.161	6.930	***	Significant
H2	PPPDM ← EGSQ	0.967	0.174	5.564	***	Significant
H3	DL ← DIR	0.967	0.174	5.564	***	Significant
H4	DL ← EGSQ	1.269	0.163	7.769	***	Significant
H5	PPPDM ← DL	0.909	0.180	5.038	***	Significant

Source: author processing, 2025. ***Statistical significance level at $p < 0.001$. * = $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.

relevant relationship to each other within the theoretical framework that has been constructed.

In particular, there are three main findings that can be concluded from the results of this hypothesis analysis:

- a) Digital readiness (DIR) and e-government service quality (EGSQ) are the main predictors of digital literacy (DL)

Both *digital readiness* and *the quality of e-government services* have been proven to significantly affect individual digital literacy. This emphasizes that people's digital literacy does not appear suddenly, but is shaped by technological readiness (e.g., digital access, skills, and motivation), as well as the quality of public digital services provided by the government (e.g., ease of use, system reliability, and service security).

- b) DIR, EGSQ, and DL have a significant influence on public participation in community decision-making (PPPDM)

The test results showed that digital public participation (PPPDM) was influenced by all independent variables, both directly and indirectly. This reinforces the theory that public involvement in digital governance is not only determined by socio-political motivations, but also highly dependent on digital capabilities and perceptions of government digital services.

- c) Digital literacy (DL) plays an important role as an important intervening variable

DL has proven to be a bridge of influence from DIR and EGSQ on PPPDM. This mediation role shows that even though citizens have high digital readiness and e-government services are well available, without adequate digital literacy, their participation in public decision-making will not be optimal.

4.5 Indirect influence (mediation)

In structural equation modeling (SEM)-based research, testing the relationship between constructs is not only limited to direct effects, but also includes indirect effects that occur through one or more intermediate variables or mediators. Indirect influences are very important to consider because they can explain the internal mechanisms of how and why an independent variable can affect a dependent variable.

In the context of this study, the digital literacy (DL) variable is assumed to play a mediating variable that bridges the influence of Digital readiness (DIR) and e-government service quality (EGSQ) on public participation in community decision-making (PPPDM). Theoretically, DL serves as a cognitive and technological prerequisite

that allows citizens to actively utilize their digital capabilities as well as e-government services in the realm of public participation.

Testing of the influence of mediation was carried out using the Sobel Test, which is one of the conventional but effective methods for measuring the significance of indirect influences. The Sobel Test works by multiplying the path coefficient from an independent variable to a mediator (a) and from the mediator to the dependent variable (b), then assess the significance of the product by considering the standard error of each line (Preacher and Hayes, 2008). If the value Z-score from the Sobel Test ≥ 1.96 (for $\alpha = 0.05$), it can be concluded that the indirect effect is statistically significant (Sobel, 1982).

For the Sobel test the formula is used:

$$Z = \frac{a \times b}{\sqrt{b^2 \times sa^2 + a^2 \times sb^2}}$$

- a H6 mediation path: DIR → DL → PPPDM.

If the value $a = 0.967$ (DIR → DL), $sa = 0.174$, $b = 0.909$ (DL → PPPDM), $sb = 0.180$ then:

$$Z = \frac{0.967 \times 0.909}{\sqrt{(0.9092^2 \times 0.1742^2) + (0.9672^2 \times 0.1802^2)}} = 3.74$$

- b H7 mediation pathway: EGSQ → DL → PPPDM.

If the value of $a = 1.269$ (EGSQ → DL), $sa = 0.163$, $b = 0.909$ (DL → PPPDM) and $sb = 0.180$ then

$$Z = \frac{1.269 \times 0.909}{\sqrt{(0.9092^2 \times 0.1632^2) + (1.2692^2 \times 0.1802^2)}} = 4.23$$

Table 7 shows that the results of the indirect influence test using the Sobel Test method show that the digital literacy (DL) variable significantly mediates the relationship between digital readiness (DIR) and e-government service quality (EGSQ) on public participation in community decision-making (PPPDM). The Z-Sobel value obtained was 3.74 for the DIR → DL → PPPDM pathway and 4.23 for the EGSQ → DL → PPPDM pathway, indicating that the two mediation pathways were significant at a confidence level of 95% ($p < 0.001$).

These results provide strong evidence that digital literacy skills are the main mechanism which bridges the influence of individual technology readiness and the quality of digital public services on citizen involvement in digital governance. This is in line with the opinion (Hair et al., 2020; Preacher and Hayes, 2008), emphasizing

TABLE 7 Recapitulation of Sobel test results.

Hypothesis	Mediation pathway	Z-value	Significance	Conclusion
H6	DIR → DL → PPPDM	3.74	$p < 0.001$	Significant mediation
H7	EGSQ → DL → PPPDM	4.23	$p < 0.001$	Significant mediation

Source: author processing, 2025.

that in multivariate causal relationship models, the identification of mediating effects is crucial to understanding the transformational process from input to outcome.

Conceptually, these findings reinforce that digital literacy is not just a supporting variable but Essential Mediation Conditions in encouraging public engagement in the digital era. In other words, even if one has high-tech readiness (DIR) and a quality e-government system (EGSQ) in place, without good digital literacy skills, digital public participation will not be achieved optimally (Alawadhi et al., 2020; Park and Kim, 2021).

This research also supports the theory of digital empowerment which states that *civic engagement* Online is greatly influenced by digital literacy, both in the form of technical skills, information understanding, and critical competence toward digital content (UNESCO, 2022; George and Mallery, 2020). In addition, DL also plays a role in shaping users' trust and comfort in the government's digital system, which in turn encourages *e-participation* (Carter and Bélanger, 2021; Cheung, 2020).

In practical terms, these findings show that the success of the government's digital transformation is not enough to rely solely on infrastructure development and the provision of digital services, but needs to be accompanied by Intervention to Increase People's digital literacy systematically and massively. This is in line with the UN recommendations within the framework of the SDGs (Goal 16), which states that participatory access to public institutions needs to be supported by citizens' digital competencies (Ahmed et al., 2020).

Thus, it can be concluded that digital literacy is a key variable that not only bridges the influence of independent variables on dependents, but also strengthens the overall structure of the conceptual model designed in this study. The presence of significant mediation shows that systemic increase in DL can magnify the effect of digital readiness policies and digital public service reforms on community participation outcomes.

5 Discussion and implications

5.1 Discussion

This study aims to examine the influence of digital readiness (DIR) and e-government service quality (EGSQ) on public participation in community decision-making (PPPDM) through digital literacy (DL) as a mediation variable. The results of data analysis using *structural equation modeling* (SEM) showed that all construct indicators met the requirements for validity and reliability, as shown through a *standardized loading factor* value of >0.5 and a *construct reliability* (CR) value >0.7 . This indicates that all the questionnaire items used have been able to represent their latent constructs consistently and stably. All of them are statistically significant, which means that all of the main paths in the SEM model are accepted. Thus, it can be said that digital readiness and quality of digital services play an important role in increasing digital literacy and public involvement in decision-making.

Theoretically, these findings reinforce previous studies that have stated that individual digital readiness, which includes technology competence and personal infrastructure readiness, is a fundamental factor in bridging the digital divide and encouraging active citizen engagement (Lindgren and Van Veenstra, 2018). In addition, the quality of e-government services, such as ease of access, response speed, and system security, has been proven to encourage increased trust and digital participation of the community (Carter and Bélanger, 2021).

One of the most important findings in this study is the significant role of digital literacy as a mediating variable. The indirect influence test through the Sobel Test proved that DL significantly mediated the influence of DIR and EGSQ on PPPDM. This means that, even if technology is available and digital services are adequate, citizens are not necessarily involved in the decision-making process unless they have sufficient digital literacy capacity.

This interpretation is in line with the views of UNESCO which states that digital literacy is not only about technical capabilities but also includes cognitive, critical, and social dimensions that allow citizens to access, evaluate, and use digital information productively and responsibly. Therefore, digital literacy is a crucial link between the availability of technology (input) and citizen participation (output) (Gómez-garcía et al., 2023).

Conceptually, DL in this context acts as a transformational mechanism that transforms digital readiness and experience into a broader form of public engagement, ranging from participation in online forums and application-based local decision-making to engagement in digital platform-based policy consulting. This indicates that investment in strengthening digital literacy will have a chain effect on strengthening digital democracy and more participatory public governance.

Furthermore, DL's role as a mediator in the relationship between EGSQ and PPPDM shows that the quality aspect of the digital system is not the only determinant of participation but depends on how the system is interpreted, understood, and used by citizens. When digital literacy is low, even sophisticated service systems will become ineffective because they are not able to be used optimally by their users (OECD, 2024).

The present study strengthens the theoretical linkage between digital literacy and citizens' participation in political decision-making. Beyond confirming that digital readiness and service quality influence engagement, the findings underscore that digital literacy is the cognitive bridge through which individuals transform access to technology into meaningful democratic action. This aligns with Norris (2003), who emphasizes that political participation in the digital era depends not only on connectivity but also on citizens' analytical and communicative competencies (Koc-Michalska et al., 2024).

In developing democracies such as Indonesia, the mediating role of digital literacy is particularly salient. Although the government invests heavily in e-government platforms, unequal access and varying digital skills can limit inclusivity. Citizens with higher digital competence are better equipped to engage in online policy consultations, provide informed feedback, and hold officials accountable (Reddy et al., 2023). Thus, improving digital literacy is not merely a technological agenda

but a democratic necessity to enhance deliberative quality and pluralism in political decision-making (Yuan et al., 2021).

From a theoretical standpoint, this research enriches digital governance studies by conceptualizing digital literacy as both a mediating and enabling factor of participatory governance. The results bridge the divide between e-government efficiency frameworks and political participation theories, offering a unified explanation of how technological capacity translates into democratic engagement. Future studies may explore how trust in digital institutions and algorithmic transparency further condition this relationship (Twizeyimana and Andersson, 2019).

Finally, from a methodological aspect, the success of this model in demonstrating an adequate goodness-of-fit *value strengthens* the conclusion that the causal relationships between variables in the model have a strong empirical basis and can be used as a reference for further research and the formulation of more inclusive and evidence-based digital public policies (Koman et al., 2024).

5.2 Implications

Theoretically, this research contributes to the development of theories in the fields of e-government, digital literacy, and public participation. These findings enrich the literature by showing that digital public participation is the result of a combination of readiness, service quality, and community literacy capacity. The study also expands on previous models by asserting that the relationship between technology and participation is not linear, but mediated by cognitive aspects and citizens' digital competencies (Preacher and Hayes, 2008). Therefore, this research can be used as a basis for developing a new conceptual model in the study of digital participation and technology-based governance (smart governance). Furthermore, the statistical testing of mediated effects through the Sobel Test reinforces the importance of indirect pathway analysis in SEM, as emphasized by Rigdon et al. (2020). Thus, this study is one of the contributions to a more complex and reflective methodology of causal relationship analysis of contemporary social phenomena.

From a practical point of view, the results of this study have very important implications for policy designers, e-government system developers, and digital education actors:

- a) The government needs to build a comprehensive and inclusive digital literacy program, with the main targets of productive age communities, students, marginalized communities, and vulnerable groups. The training is not only in the form of technical training, but also training on digital ethics, cybersecurity, and the utilization of digital public services.
- b) Digital technology investment in the public sector is not enough without strengthening the competency aspect of citizens. Therefore, budget allocations for digital training should be seen as a social investment that supports a participatory and transparent transformation of digital governance.
- c) The design of e-government platforms must consider aspects of readability and inclusion, including providing service options in local languages, accessibility features for people with disabilities, and integration with popular platforms that people already use such as WhatsApp, Facebook, and TikTok for the dissemination of public service information (OECD, 2021).
- d) Digital-based public participation activities must be made more interactive, gamified, and responsive. This can encourage citizens

to not only become passive users of digital services, but also as active contributors to the public decision-making process.

From a policy perspective, enhancing citizens' digital literacy has direct implications for strengthening democratic decision-making. Digital competence empowers citizens to engage in policy consultations, budget transparency initiatives, and online voting mechanisms, leading to more inclusive and evidence-based public decisions. Governments should thus align e-government development with civic education and participatory frameworks to ensure that digital platforms translate into substantive political participation (Larsson, 2013).

5.3 Policy and practical implications

The implications of this study extend directly to policymaking and civic practice:

- 1 Integrating digital literacy into civic education
Policymakers should institutionalize digital literacy as part of civic education curricula, focusing on citizens' ability to critically evaluate policy information and participate in online consultations.
- 2 Designing inclusive participation platforms
E-government portals should facilitate participatory mechanisms such as digital town halls, participatory budgeting, and feedback dashboards that empower citizens to co-create policy outcomes.
- 3 Addressing cultural and infrastructural barriers
Cultural hierarchies and uneven infrastructure must be addressed through localized digital inclusion programs that emphasize trust-building and collective learning.
- 4 Balancing infrastructure with human capability

Investments in broadband expansion and system quality should be paralleled with programs that enhance citizens' competence and motivation to engage politically online.

The study demonstrates that digital readiness and service quality alone are insufficient to drive participatory democracy. Sustainable political participation in digital governance emerges when technological access converges with citizens' digital competence, civic awareness, and institutional openness. This conclusion reinforces the broader vision of digital governance as a participatory, inclusive, and literacy-driven transformation of public decision-making (Contreras et al., 2023).

6 Conclusion

This study provides empirical evidence on the significant roles of digital readiness (DIR) and e-government service quality (EGSQ) in fostering public participation in political decision-making (PPDM), with digital literacy (DL) acting as a key mediating variable. Using structural equation modeling (SEM), the research confirms that digital infrastructure and service quality alone are insufficient to drive meaningful civic engagement unless accompanied by adequate digital competencies among citizens.

All constructs in the proposed model met rigorous validity and reliability standards, and the model demonstrated excellent overall fit. The findings revealed that both DIR and EGSQ positively and significantly influence DL and PPDM, and that DL, in turn, has a substantial direct effect on PPDM. The mediation analysis via the

Sobel test further indicated that DL significantly mediates the impact of DIR and EGSQ on public participation.

These results highlight the necessity of approaching digital governance not merely through technological development and service provision, but also through sustained investment in community digital literacy. Digital literacy functions as the transformative capacity that enables citizens to translate digital access and services into active and informed political participation.

Conceptually, the study enriches current discourse in digital governance by confirming that the relationship between technological readiness and public participation is non-linear and contingent upon cognitive and behavioral enablers. Practically, the research suggests that governments must pair infrastructure policies with inclusive digital education strategies to ensure equitable democratic engagement in the digital age.

Future studies are encouraged to expand this model by incorporating factors such as digital trust, platform usability, and socio-political context to further understand the dynamics of e-participation in diverse populations.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors upon reasonable request, without undue reservation. Due to confidentiality agreements with participating institutions, only anonymized datasets can be shared. Requests for access to the data should be directed to the corresponding author at anwarsadat685@gmail.com.

Ethics statement

Ethical approval was not required for this study as it involved anonymous questionnaire responses, did not collect any personally identifiable or sensitive information, and posed minimal risk to participants. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AS: Data curation, Formal analysis, Validation, Writing – original draft, Writing – review & editing.

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