# Cocreating Public Value in Smart Cities: The Interplay of Citizen Engagement, Digital Literacy, and Governance Transparency

Dwibin Kannapadang[1*], Siti Munawaroh[2], Sayugo Adi Purwanto[3]
[1]*Department of Management, Faculty of Economy, Universitas Kristen Indonesia Toraja; Tana Toraja, Indonesia*
[2,3]*Department of Accounting, Faculty of Economy, Universitas Muhammadiyah Berau; Berau, Indonesia*

*Corresponding Author E-Mail: dwibink@gmail.com

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***ABSTRACT***

*The expansion of smart city initiatives in rural and mountainous regions highlights the need to understand how public value is co-created within such contexts. This research aims to investigate the mechanisms of public value co-creation within the smart city ecosystem of Tana Toraja, a developing rural-mountainous region in Indonesia, by analyzing the interplay between digital literacy, governance transparency, and citizen engagement. This study employs a quantitative approach using SEM-PLS with data collected from 250 stratified respondents. The findings reveal that digital literacy serves as the most dominant antecedent, significantly dictating the depth of civic participation in digital platforms. While governance transparency directly enhances public value and accountability, its influence on active engagement remains moderate, suggesting that informational openness requires a baseline of public digital competence to be effective. The results confirm that public value is not merely a bureaucratic output but a co-created product resulting from the synergy between institutional transparency and empowered citizenship. This study recommends that local governments shift from being mere infrastructure providers to becoming digital education facilitators. Integrating community-based digital literacy programs with the deployment of telecommunication towers is essential to mitigate digital exclusion and ensure sustainable, inclusive smart city governance in rural contexts.*

***Keywords***: *Citizen Engagement, Digital Literacy, Governance Transparency, Public Value Co-creation, Smart City.*

## INTRODUCTION

The paradigm of the smart city has undergone a fundamental transition, shifting from a technology-centric orientation toward a human-centered framework where public value co-creation stands as the pinnacle of contemporary urban governance (Kummitha, 2025; Landa et al., 2025; Toli, 2025). This evolution recognizes that the triumph of digital urban transformation is not merely contingent upon technological infrastructure but rather on the government's capacity to cultivate a collaborative ecosystem that actively integrates citizens (Smaniotto et al., 2023; Ataman et al., 2025). Within this structural lens, three pivotal determinants emerge: citizen engagement, digital literacy, and governance transparency. These variables interact complexly to establish the foundation for sustainable public value in the digital era (Criado & Gil-Garcia, 2019; Wiranto et al., 2025). In the context of developing regions, this research gains urgency as it seeks to transmute conventional public services into digital-based systems capable of augmenting the welfare of the urban ecosystem.

However, empirical evidence shows that technology adoption is often hindered by weak interaction between authorities and citizens. In Tana Toraja Regency, despite plans to deploy 31 4G towers to support e-services, implementation faces challenges due to low

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digital literacy and difficult mountainous terrain (Central Statistics Agency, 2024). This raises concerns about whether technological investments can generate meaningful civic engagement amid the digital divide and limited public trust in transparency (Lythreatis et al., 2022; Huayra & Contreras, 2025). To address these challenges, this study proposes an integrative approach that scrutinizes the nexus of citizen engagement, digital literacy, and governance transparency. This framework posits that co-creation is not a spontaneous process but a result of institutional capacity and public literacy. By analyzing the mechanisms of actor interaction through the lens of service-dominant logic, this research aims to map how digital information openness can incentivize rural communities to contribute actively to village fund oversight and digital political participation.

A significant research gap persists in the global literature, where systematic reviews indicate that only 26 out of 60 case studies holistically explore citizen engagement perspectives, with the remainder predominantly focused on technical and infrastructural facets (Budiyanto et al., 2025; Huayra & Contreras, 2025). From a theoretical perspective, there is a dearth of empirical evidence testing how digital transparency functions as a mediating variable in the relationship between digital literacy and citizen engagement (Wiranto et al., 2025). In practice, studies exploring the dynamics of these three variables in rural-mountainous regions with unique socio-geographic characteristics like Tana Toraja are virtually non-existent (Aji & Salahudin, 2024; Suprianto, 2025). This void underscores the profound academic and practical relevance of the current study (Landa et al., 2025; Zhang et al., 2025).

Corroborating Ataman et al. (2025), this study highlights that the quality of stakeholder interaction is crucial for sustaining a smart city ecosystem, with networked governance proving more effective than closed systems in fostering civic engagement. This framework supports the evaluation of digital initiatives in Tana Toraja, such as e-Administration, e-Health, and e-Report (Zhang et al., 2025; Kannapadang et al., 2025). While platforms like "*WargaKu*" in Surabaya show high reporting efficiency, similar outcomes are constrained in Tana Toraja due to limited infrastructure and low digital literacy, underscoring the need for adaptive transparency and context-sensitive communication strategies.

The novelty of this research is anchored in its examination of the interplay between citizen engagement, digital literacy, and governance transparency, specifically within a mountainous geographic setting characterized by distinct socio-cultural dynamics. Departing from mainstream smart city discourses that predominantly focus on metropolitan centers, this study offers empirical evidence on how public value co-creation can be operationalized in infrastructure-constrained environments where only 31 4G towers serve a population of 240,000. Furthermore, this study highlights the role of digital transparency in linking the availability of open data to active civic participation in rural Indonesian contexts.

The primary objective of this inquiry is to analyze and empirically validate the reciprocal influences between citizen engagement, digital literacy, and governance transparency toward the realization of public value in Tana Toraja Regency. This research aims to identify critical bottlenecks in the co-creation process and formulate pragmatic guidelines for local governments to enhance the efficacy of human-centered smart city initiatives. The findings are anticipated to provide significant theoretical contributions to digital governance literature while offering applicable solutions for sustainable smart city development in non-urban territories.

## LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

### The Effect of Citizen Engagement on Public Value Co-creation

The phenomenon of public value co-creation within the smart city framework represents a fundamental shift in governance, prioritizing multi-stakeholder collaboration to foster sustainable urban solutions (Pereira et al., 2017). This concept repositioned citizens from mere infrastructure users to vital intellectual assets within the service design process. Recent scholarship emphasizes that digital co-creation necessitates a profound

synergy between governmental technological readiness and the participatory inclination of the public (Osborne & Strokosch, 2013; Voorberg et al., 2015; Osborne et al., 2021). Within this ecosystem, the integration of resources across the public and private sectors is essential to navigate the complexities of service delivery, particularly in regions characterized by demanding geographic conditions (Bovaird & Loeffler, 2012; Tuurnas, 2016; Osborne et al., 2016). Public value is realized when a strategic harmony is achieved between the government's visionary objectives and the authentic needs of the populace, articulated through inclusive digital channels.

Citizen engagement is regarded as a vital instrument that bridges public aspirations with policy outputs within the smart city landscape. Active involvement fosters a sense of collective ownership toward regional innovations, which subsequently enhances the efficacy of digital program implementation. Empirical evidence by Nabatchi et al. (2017) suggests that civic participation significantly mitigates the risk of failure in smart city projects by providing a direct validation mechanism from the end-users. Furthermore, meaningful participation via digital platforms has been proven to generate broader social dividends, such as the strengthening of social capital and communal trust (Kitchin, 2014; Paskaleva et al., 2021). Citizen engagement serves as the primary foundation for the success of localized value co-creation.

H1: Citizen engagement has a positive influence on public value co-creation.

**The Effect of Digital Literacy on Citizen Engagement**

The efficacy of civic involvement within digital governance is fundamentally contingent upon the level of digital literacy among the populace. Digital literacy in this context is not merely the ability to operate devices or access online platforms. Rather, it encompasses a broad spectrum of competencies, including technical skills to navigate digital interfaces, critical thinking to assess and interpret information accurately, and ethical awareness to engage responsibly in online interactions with public information systems. Without sufficient digital proficiency, citizens' engagement with smart city platforms such as e-Health, e-Report, and other e-Government services is likely to remain limited, perpetuating existing participation gaps across various societal cohorts and potentially reinforcing structural inequalities in access to public resources (Robinson et al., 2020; Helsper, 2021).

Extant literature emphasizes that digital literacy serves as a critical enabler of civic participation, equipping individuals with the self-efficacy and confidence necessary to contribute meaningfully to online policy dialogues, community decision-making processes, and collaborative governance initiatives (Emejulu, 2014; Polat, 2023; Ge et al., 2025). In rural and geographically challenging contexts, enhancing digital literacy is particularly crucial, as it functions as both a protective and proactive mechanism to prevent digital exclusion, which, if unaddressed, may undermine the success of smart city initiatives and hinder the equitable co-creation of public value. By fostering greater digital capacity within communities, local governments can not only improve the accessibility and usability of digital platforms but also strengthen trust, transparency, and sustained engagement among citizens, thereby creating a more inclusive, participatory, and resilient digital governance ecosystem.

H2: Digital literacy has a positive influence on citizen engagement.

**The Effect of Governance Transparency and Citizen Engagement**

Institutional transparency, particularly through the provision of open, timely, and easily accessible data, serves as a crucial driver for fostering public interest and participation in civic affairs. When governments demonstrate a consistent commitment to information openness, they not only enhance the legitimacy of their actions but also reduce perceived risks, uncertainty, and public skepticism, factors that often constitute

significant barriers to meaningful civic engagement (Grimmelikhuijsen et al., 2017; Wirtz, 2019).

Transparent digital platforms enable citizens to observe, track, and evaluate decision-making processes, budget allocations, and policy implementations in real-time, which in turn encourages more active and informed participation in governance initiatives (Cucciniello et al., 2017; Ruijer et al., 2020). In regional governance contexts, such as rural or mountainous areas, digital transparency operates as a tangible manifestation of institutional accountability, providing citizens with the tools and confidence to engage in the co-creation of public value. By facilitating continuous feedback loops and reducing information asymmetries, transparency strengthens trust between authorities and communities and serves as a mechanism through which civic engagement can emerge organically, fostering both procedural legitimacy and participatory resilience.

H3: Governance transparency has a positive influence on citizen engagement.

**The Effect of Governance Transparency on Public Value Co-Creation**

The direct relationship between governance transparency and public value co-creation lies in its capacity to enhance both the efficiency of service delivery and the equitable distribution of public resources. By ensuring that information regarding policies, budgets, and administrative processes is open, timely, and accessible, governments can allocate resources more accurately and reduce opportunities for mismanagement, corruption, or procedural errors (Wang et al., 2024). This clarity not only strengthens procedural integrity but also builds public confidence, creating a conducive environment for citizens to participate actively in co-creating value within their communities. Contemporary studies by Moon (2020) and Bertot et al. (2022) consistently demonstrate that higher levels of digital transparency are positively associated with public satisfaction, largely because citizens gain a clear understanding of service procedures, performance outcomes, and the rationale behind administrative decisions.

Beyond immediate procedural benefits, open data also serves as a catalyst for innovation, enabling third-party developers, civil society organizations, and entrepreneurial actors to create solutions that enhance public welfare and address local needs. Such innovations can range from mobile applications that facilitate real-time reporting to analytical tools that improve the monitoring and evaluation of public programs, thereby amplifying the impact of governance initiatives on broader communities (Kassen, 2013; Meijer, 2018). Transparency should not be perceived merely as a statutory or regulatory requirement, rather, it represents a strategic asset that enables governments to foster sustainable, participatory, and resilient mechanisms of public value co-creation (Cordella & Paletti, 2018). By embedding transparency into the core of administrative processes, policymakers can ensure that citizens are not only informed but also empowered to collaborate meaningfully in shaping and improving public services.

H4: Governance transparency has a positive influence on public value co-creation.

The extant literature reveals a complex interplay between individual capacity (literacy), organizational conduct (transparency), and societal behavior (engagement) in generating public value. In regions such as Tana Toraja, infrastructural constraints must be counterbalanced by robust strategies for literacy empowerment and a steadfast commitment to transparency. The integration of these three variables forms a resilient smart city governance model, where technology functions as an enabler for the realization of an empowered and prosperous society (Smaniotto et al., 2023; Wiranto et al., 2025). This inquiry aims to bridge the empirical gap regarding the interaction of these determinants within the context of a digitally transforming mountainous region.

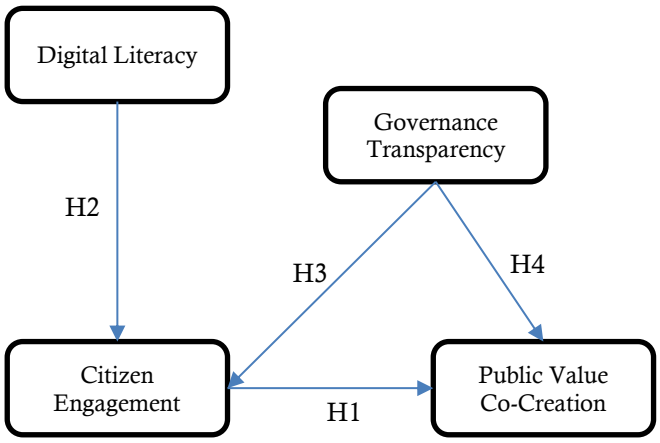


**Figure 1.** Research Framework

Figure 1 illustrates the conceptual relationships among digital literacy, governance transparency, citizen engagement, and public value co-creation. In this framework, digital literacy and governance transparency are depicted as key drivers that influence citizen engagement, which in turn directly contributes to the co-creation of public value. Both digital literacy and governance transparency also exert a direct effect on public value co-creation, highlighting their dual role as both enablers of active participation and independent contributors to the overall effectiveness and impact of smart city initiatives. This model emphasizes that fostering public value in a digital governance context requires not only enhancing citizens' skills and knowledge but also ensuring institutional openness and accountability.

## RESEARCH METHODS

This study employs a quantitative causal-explanatory design using Structural Equation Modeling–Partial Least Squares (SEM-PLS) to examine how digital literacy and governance transparency influence citizen engagement and public value co-creation in Tana Toraja Regency. SEM-PLS is chosen for its ability to handle complex models with multidimensional latent variables, flexible sample requirements, and no strict normality assumptions. The study population consists of Tana Toraja residents using government digital services, such as e-Health and e-Report. Tana Toraja was chosen for its transition into a rural smart city, supported by 31 4G towers and limited prior research on digital transformation in its mountainous, culturally distinct context. Data were collected using purposive sampling combined with proportionate stratified random sampling across ten districts, Makale, North Makale, South Makale, Mengkendek, Gandangbatu Sillanan, Sangalla, North Sangalla, South Sangalla, Bittuang, and Masanda, to capture diverse public perceptions from urban centers to remote rural areas.

Respondents were eligible if they were aged 17–60 and had active mobile device access. Based on G*Power analysis (effect size $f^2 = 0.15$, $\alpha = 0.05$, power = 0.80), the minimum sample size was 119. To account for a potential 20% non-response rate and ensure stable SEM-PLS estimations, a quota of 25 respondents per stratum was applied, resulting in a final sample of 250, providing a precise and reliable dataset for analysis (Hair et al., 2019). The primary data were collected via a hybrid survey (online and offline) to address geographical challenges in Tana Toraja Regency. The structured questionnaire was developed from literature covering citizen engagement, based on digital civic participation. Digital literacy addresses technical and cognitive skills. Governance transparency, focusing on accountability and information disclosure. Public value co-creation, measuring bureaucratic effectiveness, and service innovation. Responses were captured on a five-point Likert scale, and instrument validity was ensured through expert review and a pilot study with 30 participants.

Using SmartPLS 4.0, the analysis was conducted in two stages. First, the measurement (outer) model was evaluated through convergent validity (loading > 0.707; AVE > 0.5), discriminant validity (HTMT < 0.90), and reliability (Cronbach's Alpha and Composite Reliability > 0.7). Second, the structural (inner) model was assessed using $R^2$, $f^2$, and $Q^2$. Hypotheses were tested using bootstrapping with 5,000 sub-samples to obtain p- and t-statistics. This research fully complies with the ethical protocol of research. All respondents were given an informed consent sheet that affirmed the nature of voluntary participation and the right to withdraw without sanction. The integrity of the data is maintained through strict anonymity procedures, where the information is only processed for the purposes of scientific aggregate analysis. Furthermore, the researcher ensured that all stages of data collection were carried out with respect for the local cultural order of the Tana Toraja community to maintain the harmony of the relationship between the researcher and the community being studied.

## RESULTS

The analysis of respondent characteristics provides context for understanding the relationship between digital literacy and public value in Tana Toraja Regency. The sample reflects diverse ages, education levels, and residential locations, highlighting potential digital divides. Most participants are of productive age, likely more adaptable to e-government services, while varying educational backgrounds suggest differences in digital comprehension. Distribution across ten priority districts also underscores the link between physical access and usage of digital platforms like e-Health and e-Report.

**Table 1.** Respondent Demographic Profile

| Category Characteristic | Sub-Category | Frequency (f) | Percentage (%) |
|---|---|---|---|
| Gender | Male | 118 | 47.2% |
| | Female | 132 | 52.8% |
| Age Range | 17 – 25 Years | 65 | 26.0% |
| | 26 – 40 Years | 115 | 46.0% |
| | 41 – 60 Years | 70 | 28.0% |
| Final Education | High School/Equivalent | 82 | 32.8% |
| | Diploma/Bachelor (S1) | 148 | 59.2% |
| | Postgraduate (S2/S3) | 20 | 8.0% |
| Jobs | ASN/Public Servant | 55 | 22.0% |
| | Private Sector/Entrepreneurship | 110 | 44.0% |
| | Student | 45 | 18.0% |
| | Others (Farmer/IRT) | 40 | 16.0% |
| Primary Internet Access | Mobile Data (4G/5G) | 210 | 84.0% |
| | Home/Office WiFi | 40 | 16.0% |

Table 1 shows that the preponderance of respondents within the 26–40 age cohort suggests that productive "digital migrants" serve as the primary catalysts for the public value co-creation process in Tana Toraja. This finding aligns with the discourse that regional digital maturity is frequently spearheaded by societal groups with high intensities of bureaucratic interaction (Wiranto et al., 2025). Although the majority of participants possess undergraduate qualifications, the significant presence of respondents with secondary education (32.8%) underscores a critical imperative for local authorities: the design of governance transparency frameworks must prioritize simplicity and intuitive accessibility to remain user-friendly for diverse cognitive backgrounds. Furthermore, the heavy reliance on mobile data access (84%) amidst the formidable mountainous topography of Toraja reinforces the strategic urgency of the 31-tower 4G infrastructure project as a non-negotiable prerequisite. These demographic insights provide empirical evidence that, despite a robust participatory inclination among citizens, infrastructural disparity remains a potent moderating variable. Such a factor cannot be overlooked if the objective is to cultivate an inclusive public value ecosystem within rural landscapes.

The data analysis in this study was carried out in stages using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach through SmartPLS 4.0 software. The following is the result of the SEM-PLS data processing below.

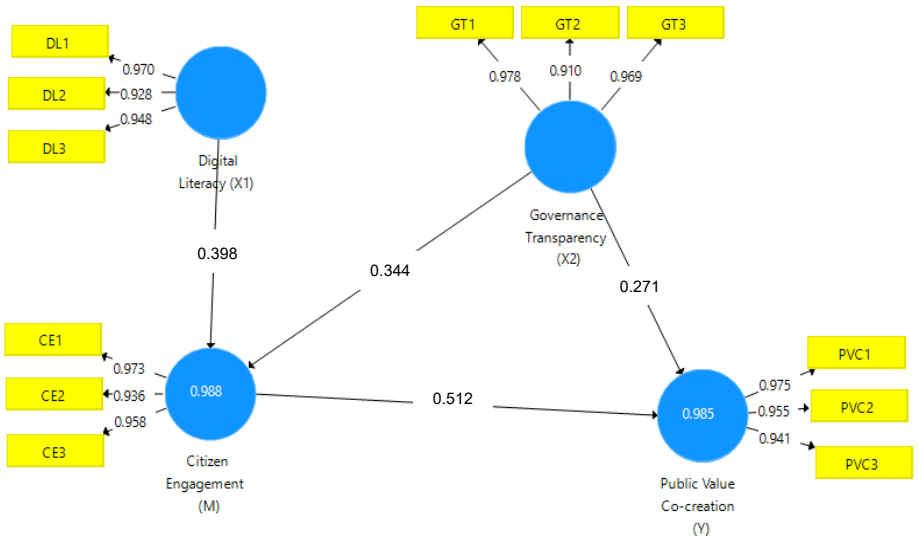


**Figure 2.** Results of SEM-PLS Data Processing

Figure 2 shows that the evaluation of the measurement model (outer model) begins this analysis to verify the validity and reliability of the instrument against latent constructs. This procedure includes testing for convergent validity, discriminant validity, and internal consistency reliability. Referring to the PLS-SEM standard, the convergent validity is met if the loading factor coefficient exceeds 0.70 and the Average Variance Extracted (AVE) value is above the threshold of 0.50. Through these parameters, the researcher guarantees that each manifest indicator can accurately and consistently represent its latent variables before further structural testing is carried out.

**Table 2.** Measurement Model (Convergent Validity & Reliability)

| Construct | Indicator | Loading | Cronbach's Alpha | Composite Reliability | AVE |
|---|---|---|---|---|---|
| Digital Literacy | DL1 | 0.970 | 0.948 | 0.967 | 0.907 |
| | DL2 | 0.928 | | | |
| | DL3 | 0.948 | | | |
| Governance Transparency | GT1 | 0.978 | 0.941 | 0.963 | 0.897 |
| | GT2 | 0.910 | | | |
| | GT3 | 0.969 | | | |
| Citizen Engagement | CE1 | 0.973 | 0.951 | 0.968 | 0.910 |
| | CE2 | 0.936 | | | |
| | CE3 | 0.958 | | | |
| Public Value Co-creation | PVC1 | 0.975 | 0.955 | 0.971 | 0.917 |
| | PVC2 | 0.955 | | | |
| | PVC3 | 0.941 | | | |

Table 2 presents the validity and reliability assessment of the research constructs. Convergent validity is confirmed for all variables, with loading factors well above 0.707 and AVE values exceeding 0.89, indicating that each indicator strongly represents its latent construct. Digital literacy ranges from 0.928 to 0.970 with an AVE of 0.907, governance transparency from 0.910 to 0.978 with an AVE of 0.897, citizen engagement from 0.936 to 0.973 with an AVE of 0.910, and public value co-creation from 0.941 to 0.975 with an AVE of 0.917. Internal consistency is equally robust, with Cronbach's Alpha (CA) and Composite Reliability (CR) values exceeding 0.94 for all constructs, confirming the instruments' stability. Digital literacy has a CA of 0.948 and a CR of 0.967,

governance transparency of 0.941 and 0.963, citizen engagement of 0.951 and 0.968, and public value co-creation of 0.955 and 0.971. These results provide strong methodological assurance that the primary data are reliable for structural model estimation and hypothesis testing.

The next phase of measurement model evaluation is focused on discriminant validity testing to verify that each latent construct in the research model is empirically unique and does not overlap with any other. This investigation was conducted by adopting the Heterotrait-Monotrait Ratio (HTMT) approach, which is currently seen as the most stringent and accurate parameter in evaluating construct differentiation in the PLS-SEM model.

**Table 3.** Heterotrait-Monotrait Ratio (HTMT)

| Variable | Digital Literacy | Government Transparency | Citizen Engagement |
|---|---|---|---|
| Governance Transparency (GT) | 0.542 | - | |
| Citizen Engagement (CE) | 0.621 | 0.568 | - |
| Public Value Co-creation (PVC) | 0.633 | 0.587 | 0.704 |

*Remarks: all HTMT values < 0.90 → meet the discriminant validity.*

Based on Table 3, the applicable methodological results, the integrity of discriminant validity is achieved if the HTMT coefficient between variables is below the critical threshold of 0.90. Values that exceed these ratios will indicate a conceptual collinearity problem that can distort the results of the analysis. The empirical findings in this study show that all construct pairs have HTMT values that are consistently below the recommended limits. Consequently, this measurement model is stated to have met the prerequisites for validity and reliability comprehensively. This methodological certainty allows the research to proceed to the next stage, namely structural model estimation (inner model), in order to dissect causal relationships and test the significance of the hypotheses that have been proposed.

Once the validity and reliability at the measurement level are met, the next crucial step is to estimate the structural model or inner model. This procedure is oriented to verify the significance of causal relationships between latent constructs and evaluate the predictive power of the model against the proposed hypothesis. The quality of the structural model in this study was comprehensively measured through triangulation of statistical metrics, which included the determination coefficient ($R^2$), effect size ($f^2$), and predictive relevance (Q The integration of these three parameters provides a scientific justification for the extent to which independent variables are able to construct variance in dependent variables.

**Table 4.** Structural Model Evaluation

| Endogenous Variable | $R^2$ | Interpretation | $Q^2$ | Predictive Relevance | Exogenous Variable | $f^2$ | Effect Size |
|---|---|---|---|---|---|---|---|
| Citizen Engagement | 0.652 | Moderate | 0.421 | High | Digital Literacy | 0.214 | Medium |
| | | | | | Governance Transparency | 0.182 | Medium |
| Public Value Co-creation | 0.713 | Substantial | 0.468 | High | Citizen Engagement | 0.337 | Large |
| | | | | | Governance Transparency | 0.156 | Medium |

Table 4 shows that the proposed research model demonstrates strong explanatory power. The citizen engagement construct recorded an $R^2$ of 0.652, indicating that the synergy between digital literacy and governance transparency explains 65.2% of civic participation variance within the smart city ecosystem, reflecting moderate predictive strength. Meanwhile, public value co-creation yielded an $R^2$ of 0.713, showing that citizen engagement and governance transparency together account for 71.3% of the variance in public value creation, approaching a robust predictive level. Predictive relevance is further

confirmed by $Q^2$ values of 0.421 for citizen engagement and 0.468 for public value co-creation, both exceeding the zero threshold and indicating proficient predictive accuracy.

Effect size ($f^2$) analysis highlights the contributions of each path. Digital literacy's influence on citizen engagement ($f^2 = 0.214$) and governance transparency's impact on the same variable ($f^2 = 0.182$) are classified as medium effects. The relationship between citizen engagement and public value co-creation shows a strong effect ($f^2 = 0.337$), nearing a large effect threshold, while governance transparency contributes a moderate effect to public value co-creation ($f^2 = 0.156$). Together, the consistent results across $R^2$, $f^2$, and $Q^2$ provide a solid methodological foundation for bootstrapping to examine hypothesis significance.

In hypothesis testing, a relationship between variables is declared significant if the t-statistic value is greater than 1.96 at a significance level of 5%, or if the p-value is less than 0.05. Using this approach, the study can empirically evaluate whether digital literacy and governance transparency have an effect on citizen engagement, as well as whether these variables contribute to increasing public value co-creation in smart city ecosystems.

**Table 5.** Hypothesis Testing

| Hypothesis | Path Relationship | Path Coefficient | t-statistic | p-value | Result |
|---|---|---|---|---|---|
| H1 | Citizen Engagement → Public Value Co-creation | 0.512 | 7.845 | 0.000 | Significant |
| H2 | Digital Literacy → Citizen Engagement | 0.398 | 5.621 | 0.000 | Significant |
| H3 | Governance Transparency → Citizen Engagement | 0.344 | 4.983 | 0.000 | Significant |
| H4 | Governance Transparency → Public Value Co-creation | 0.271 | 3.214 | 0.001 | Significant |

Through this structural model evaluation, the study transcends a mere assessment of the correlations between variables, it provides a profound understanding of the underlying mechanisms by which digital literacy, governance transparency, and citizen engagement interact to foster sustainable public value within the smart city development framework.

Table 5 shows that the structural model assessment confirms that all hypothesized relationships within this inquiry are positive and statistically significant. The citizen engagement construct emerged as the most potent determinant of public value co-creation, underscoring that active civic involvement is the paramount factor in generating public value within smart city governance. Furthermore, digital literacy and governance transparency play indispensable roles in amplifying community participation and catalyzing collaborative value creation processes. These findings suggest that the synergy between public digital competence and governmental transparency constitutes a fundamental pillar for the successful implementation of smart city concepts oriented toward public value realization.

## DISCUSSION

Empirical evidence from this study shows that citizen engagement positively influences public value co-creation, indicating that higher societal participation in urban governance enhances collaborative public value generation. In the smart city context, citizens act as proactive partners in planning, implementing, and evaluating public policies rather than passive service recipients. This aligns with Public Value Theory, which emphasizes that public value emerges through state-citizen collaboration, supported by digital technologies that enable residents to contribute directly to decision-making and the development of services responsive to societal needs. Contemporary scholarship further suggests that civic involvement via digital government platforms can enhance the quality of public policy while simultaneously bolstering institutional legitimacy. A study by Twizeyimana and Andersson (2019) corroborates that citizen participation in digital governance ecosystems strengthens public value creation through

data-driven and technology-enabled collaborative mechanisms. Furthermore, research by Van and Van (2019) indicates that community engagement within digital participation platforms contributes to the improvement of public service quality and the sustainability of urban governance. The findings of this inquiry reinforce the argument that citizen engagement serves as a fundamental element in driving the realization of public value within the smart city context.

The results indicate that digital literacy positively influences citizen engagement, highlighting that public proficiency in digital technologies is a key driver of civic participation in smart city governance. Digital literacy enables individuals to access public information, use e-government platforms, and engage in policy dialogues, while gaps in digital skills can limit civic involvement. Supporting studies by Mergel et al. (2019) and Park (2022) show that enhancing digital competencies boosts participation in digital government services and strengthens state-citizen communication. Thus, digital literacy functions not only as a technical skill but also as social capital that empowers active participation in smart city governance.

The findings indicate that governance transparency significantly enhances citizen engagement, highlighting that openness in government processes is essential for fostering public participation. In smart cities, transparency is implemented through digital initiatives such as open data portals, public information repositories, and online reporting systems, which improve access to policy information and build public trust. Studies by Mergel et al. (2019) and Arshad and Khurram (2020) confirm that digital transparency encourages citizen involvement in decision-making and strengthens trust in government. Therefore, governance transparency is a crucial factor in cultivating collaborative relationships between the state and citizens within the smart city ecosystem.

The final hypothesis shows that governance transparency positively influences public value co-creation, as openness in government operations enables collaborative processes between the state and citizens. By providing wider access to policy, decision-making, and performance information, transparency fosters an inclusive participatory space that encourages public contribution to urban problem-solving. Research shows that digital transparency strengthens public value creation through data-driven collaboration and civic engagement. Meijer et al. (2016) note that transparency in smart city governance enhances accountability and community involvement in public innovation, while Scupola and Mergel (2022) highlight that open government data fosters collaboration, driving service innovation and social value. Thus, governance transparency acts not just as an accountability mechanism but as a key catalyst for public value co-creation in smart cities.

These findings imply that smart city policymakers should prioritize citizen engagement, digital literacy, and governance transparency. Enhancing digital skills enables citizens to participate effectively in e-government and policy processes. Transparent government operations build public trust and encourage collaborative problem-solving. Active citizen involvement supports data-driven innovation and improves public service quality. These strategies foster inclusive, participatory, and value-creating urban governance.

## CONCLUSION

This study clarifies the causal mechanisms within the smart city ecosystem of Tana Toraja Regency, emphasizing digital literacy and governance transparency as key direct antecedents. The findings indicate that citizen engagement directly enhances public value co-creation, while digital literacy and governance transparency both exert direct and significant influences on citizen engagement as well as on the creation of public value. These results highlight that the effectiveness of smart city initiatives in developing regions relies not only on technological infrastructure but also on the capacity of citizens to actively participate and on the transparency of governmental operations. The study further underscores the applicability of service-dominant logic in the public sector, demonstrating that public value emerges from the proactive engagement of citizens and the openness and responsiveness of institutions.

The implications suggest that policymakers should integrate digital literacy programs with infrastructure deployment, such as the 31-tower 4G network, shifting the government's role from infrastructure provider to educational facilitator to optimize platforms like e-Health and e-Report for collaborative value creation. Transparency initiatives should move beyond passive disclosure, employing interactive dashboards that allow citizens to monitor resource allocation in real time, thereby enhancing accountability and participation. This study is limited to a rural-mountainous context, and the effects observed may differ in urban or culturally distinct settings. Future research should consider additional moderating variables, such as local wisdom, and adopt mixed-method approaches to better capture psychological and social barriers to digital participation. By addressing these dimensions, subsequent studies can deepen understanding of how digital literacy, governance transparency, and citizen engagement collectively drive sustainable public value in smart city governance.

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