



JOURNAL
AMJEL

ASIAN MULTIDISCIPLINARY
RESEARCH JOURNAL OF
ECONOMY AND LEARNING

ISSN 3063-1424

www.asianmultidisciplinary.com

journal@asianmultidisciplinary.com



Asian Multidisciplinary Research Journal of Economy and Learning

Volume 2, Issue 7, Page 01 – 10, 2025, Article No. AMJEL. 00058
ISSN: 3063-1424

Emphasizing Digital Governance and Development Empowering Rural Transformation through Village Information Systems (SID): Evidence from Aceh Tamiang, Indonesia

**Vini Vaneysha ^{++ *1}, Satia Negara Lubis ², Muhammad
Taufiq ³**

¹ Regional and Rural Development Planning, Graduate School, Universitas Sumatera Utara, Medan, Indonesia

^{2,3} Regional and Rural Development Planning, Lecturer, Universitas Sumatera Utara, Medan, Indonesia

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

<https://doi.org/10.70471/15822q76>

Received: 09/07/2025

Accepted: 21/07/2025

Published: 22/07/2025

Original Research Article

Abstract

This study investigates the role of the Village Information System (Sistem Informasi Desa/SID) in accelerating rural development by examining the influence of three critical supporting factors: human resources, infrastructure, and IT services. Focusing on Kota Kualasimpang Subdistrict in Aceh Tamiang, Indonesia, the research adopts a quantitative approach involving 99 respondents selected

⁺⁺ Indonesia;

*Corresponding author: Email: vinivaneysha98@gmail.com

Cite as: Vaneysha, V., Lubis, S. N., & Taufiq, M. (2025). *Emphasizing Digital Governance and Development Empowering Rural Transformation through Village Information Systems (SID): Evidence from Aceh Tamiang, Indonesia, Indonesia. Asian Multidisciplinary Research Journal of Economy and Learning, 2(7), 1–10.*

<https://doi.org/10.70471/15822q76>

from five villages through accidental sampling. Data were collected via structured questionnaires and analyzed using descriptive statistics, validity and reliability testing, classical assumption diagnostics, and multiple linear regression. The findings reveal that all three factors—human resources, infrastructure, and IT services—significantly and positively impact the acceleration of rural development. Among these, IT services exhibit the most substantial influence, highlighting the strategic importance of technological readiness in local governance. The study underscores the vital role of digital infrastructure and capacity building in promoting effective and inclusive village-level development, particularly in autonomous regions such as Aceh. The results offer empirical insights for policymakers and practitioners aiming to optimize SID implementation as a transformative tool for sustainable rural advancement.

Keywords: *Village Information System, Rural Development, Human Resources, Infrastructure, IT Services, Aceh Tamiang, Indonesia*

1. Introduction

Achieving balanced and sustainable rural development remains a major challenge in Indonesia, particularly in areas with special autonomy such as Aceh Tamiang. Structural issues such as inadequate infrastructure and limited human resource capacity continue to hinder progress. In recent years, the adoption of digital tools—most notably the Village Information System (Sistem Informasi Desa/SID)—has become a key strategic initiative to improve governance, service delivery, and local development outcomes (Kurniawati et al., 2025; Sihotang et al., 2023).

Internationally, the integration of information and communication technologies (ICT) into rural planning has demonstrated significant benefits. Large-scale studies in China show that digital village initiatives enhance rural revitalization by strengthening resource management, institutional networks, and access to markets (Wang et al., 2023; Deng et al., 2024). These findings illustrate how digital transformation can play a pivotal role in rural governance innovation.

In the Indonesian context, successful implementation of SID goes beyond infrastructure provision. The effectiveness of such systems is closely tied to the digital competencies and readiness of human resources at the village level. Research confirms a strong correlation between ICT development and improvements in the Human Development Index (HDI), highlighting the importance of human capital and digital literacy in rural areas (Sari, 2024).

ICT also contributes to improved accountability and performance in local government through enhanced internal control systems and digital administrative platforms (Boufounou et al., 2024). However, while human and physical infrastructure have been widely studied, the specific contribution of IT services—such as technical assistance, training, and system reliability—remains underexplored, especially in regions like Aceh where digital adoption faces structural limitations (Roza et al., 2025).

Given Aceh's unique cultural and administrative setting, SID implementation must be tailored to local conditions. Studies on smart villages emphasize that digital development strategies should reflect the socio-economic characteristics of rural communities, including their reliance on agriculture, tourism, and coastal industries (Sangnak, 2025). Furthermore, from a digital governance perspective, SID has the potential to increase public engagement and trust by improving transparency and access to information (Tolbert & Mossberger, 2006; Wang et al., 2025).

Despite its promise, the adoption of SID is often hindered by low digital proficiency, insufficient infrastructure, and high operational costs—barriers that reflect broader systemic challenges in rural digitization (Tahmasebi, 2023). Additionally, national policy frameworks such as Indonesia's Low Carbon Development Initiative (LCDI) highlight the importance of integrated multi-level coordination in the deployment of digital infrastructure and services (Bappenas, 2019).

In light of these issues, this study aims to examine how human resources, infrastructure, and IT services influence the acceleration of rural development through SID in the

subdistrict of Kota Kualasimpang, Aceh Tamiang. By focusing on a region with distinct governance characteristics, the research offers new empirical insights into digital transformation at the village level and contributes to the growing body of knowledge on e-governance in decentralized contexts.

2. METHODS

2.1 Research Design

This study employed a quantitative explanatory research design to assess the impact of supporting factors—human resources, infrastructure, and IT services—on the acceleration of rural development through the implementation of the Village Information System (SID). The aim was to test causal relationships among the variables using empirical data and statistical modeling. A cross-sectional survey was conducted to capture perceptions from respondents at a single point in time, aligning with the goal of understanding current implementation outcomes of SID in rural governance.

2.2 Population and Sample

The target population comprised 5,804 heads of households (HHs) across five SID-implementing villages in the Kota Kualasimpang Subdistrict, Aceh Tamiang Regency. The sample size was calculated using Slovin's formula with a 10% margin of error, resulting in 99 respondents. A proportional stratified sampling method was applied to ensure village-level representation. Within each stratum, accidental (convenience) sampling was used, targeting respondents who had awareness of SID operations or had interacted with SID services. The final distribution included households from Desa Kota Kualasimpang, Desa Kota Lintang, Desa Perdamaian, Desa Sriwijaya, and Desa Bukit Tempurung.

2.3 Data Collection Techniques

Primary data were gathered using structured self-administered questionnaires consisting of closed-ended items on a five-point Likert scale. The questionnaire was distributed through direct visits to each village. To ensure contextual relevance, items were developed based on literature reviews and aligned with indicators from existing SID performance assessments. Secondary data were obtained from institutional records such as BPS, Bappeda, the Village Office, and academic references, providing context on population demographics, SID infrastructure, and governance.

2.4 Operational Definitions and Variables

The study involved **one dependent variable** and **three independent variables**:

- **Dependent Variable (Y):** *Acceleration of Rural Development* – operationalized through indicators such as improved public services, infrastructure expansion, and community empowerment initiatives.
- **Independent Variables:**
 - X_1 – **Human Resources:** The readiness, competency, and distribution of SID-related personnel.
 - x_2 – **Infrastructure:** Availability and condition of physical and digital infrastructure supporting SID operations.
 - x_3 – **IT Services:** Quality and availability of digital tools, internet connectivity, and technical support.

All variables were measured using indicators adapted from validated scales in rural development and e-governance literature.

2.5 Validity and Reliability Testing

A pilot study involving 30 respondents was conducted to assess instrument quality. Content validity was confirmed via expert review. Construct validity was tested using Pearson correlation coefficients, where all items exceeded the critical r-value of 0.361, confirming validity. Reliability testing using Cronbach's Alpha yielded values above 0.70 for all variables: Human Resources (0.808), Infrastructure (0.700), IT Services (0.732), and Rural Development (0.808), indicating strong internal consistency.

2.6 Data Analysis

Data were analyzed using SPSS version 24. The analysis involved:

- Descriptive statistics to summarize respondent profiles.
- Assumption tests, including:
 - Normality (Kolmogorov–Smirnov test)
 - Linearity (ANOVA for deviation from linearity)
 - Multicollinearity (Tolerance and Variance Inflation Factor [VIF])
 - Heteroskedasticity (Scatterplot examination)
- Inferential analysis through multiple linear regression to assess both individual (t-test) and collective (F-test) effects of independent variables on the dependent variable.
- The regression model used was:

$$Y = a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

2.7 Ethical Considerations

All participants provided informed verbal consent prior to participation. The study ensured anonymity, confidentiality, and voluntary participation. No personally identifiable information was collected. The research adhered to ethical standards consistent with the Declaration of Helsinki and local academic research protocols. Approval was obtained from relevant village authorities before data collection commenced.

3. Results and Discussions

3.1 Result

3.1.1 Demographic Profile of Respondents

A total of 99 respondents from five villages in Kota Kualasimpang participated in this study. The sample was distributed proportionally across Desa Kota Kualasimpang (10 respondents), Desa Kota Lintang (37), Desa Perdamaian (12), Desa Sriwijaya (16), and Desa Bukit Tempurung (24). The age distribution indicated that 48.48% were between 31–40 years, followed by 32.32% aged 20–30, and 19.20% aged 41–50.

Table 1. Respondent Characteristics by Age

Criteria	Respondents	Percentage (%)
20–30 years	32	32.32%
31–40 years	48	48.48%
41–50 years	19	19.20%
Total	99	100%

Educational attainment among respondents was relatively high. About 44.44% were high school graduates, 38.38% held undergraduate (bachelor's) degrees, and 6.07% held a master's degree. This suggests a generally educated sample, conducive to understanding and engaging with digital platforms such as SID.

Table 2. Respondent Characteristics by Education

Criteria	Respondents	Percentage (%)
Junior High School (SMP)	11	11.11%
Senior High School (SMA)	44	44.44%
Undergraduate (S1)	38	38.38%
Postgraduate (S2)	6	6.07%
Total	99	100%

Occupationally, respondents were predominantly engaged in the informal sector. Entrepreneurs made up the largest group (41.33%), followed by civil servants (29.33%), traders (18.67%), and contract staff (10.67%).

Table 3. Respondent Characteristics by Occupation

Criteria	Respondents	Percentage (%)
Civil Servants	29	29.33%
Contract Staff	10	10.67%
Entrepreneurs	41	41.33%
Traders	19	18.67%
Total	99	100%

In terms of income, 37.37% of respondents earned between IDR 2–4 million per month, while 33.33% earned between IDR 4–6 million. A smaller group (10.10%) earned less than IDR 2 million, and 19.20% reported monthly earnings exceeding IDR 6 million.

Table 4. Respondent Characteristics by Income

Criteria	Respondents	Percentage (%)
< IDR 2,000,000	10	10.10%
IDR 2,000,000 – 4,000,000	37	37.37%
IDR 4,000,000 – 6,000,000	33	33.33%
> IDR 6,000,000	19	19.20%
Total	99	100%

3.1.2 Descriptive Statistics of Key Variables

Descriptive statistics were used to analyze perceptions toward each of the study's variables. Mean scores were generally favorable:

Human Resources (X_1): Mean = 3.89

Infrastructure (x_2): Mean = 3.94

IT Services (x_3): Mean = 4.12

Rural Development Acceleration (Y): Mean = 4.06.

Table 5. Respondent Characteristics by Income

Item Number	r-count	r-table	Remarks
Human Resources (X1)			
Human Resources 1.1	0.451	0.361	Valid
Human Resources 1.2	0.730	0.361	Valid
Human Resources 1.3	0.559	0.361	Valid
Human Resources 1.4	0.815	0.361	Valid
Human Resources 1.5	0.878	0.361	Valid
Human Resources 1.6	0.850	0.361	Valid
Infrastructure (X2)			
Infrastructure 2.1	0.592	0.361	Valid
Infrastructure 2.2	0.726	0.361	Valid
Infrastructure 2.3	0.688	0.361	Valid
Infrastructure 2.4	0.432	0.361	Valid
Infrastructure 2.5	0.632	0.361	Valid
Infrastructure 2.6	0.715	0.361	Valid
IT Services (X3)			

IT Services 3.1	0.525	0.361	Valid
IT Services 3.2	0.676	0.361	Valid
IT Services 3.3	0.667	0.361	Valid
IT Services 3.4	0.774	0.361	Valid
IT Services 3.5	0.718	0.361	Valid
IT Services 3.6	0.596	0.361	Valid
Rural Development (Y)			
Rural Development 1.1	0.856	0.361	Valid
Rural Development 1.2	0.797	0.361	Valid
Rural Development 1.3	0.754	0.361	Valid
Rural Development 1.4	0.774	0.361	Valid
Rural Development 1.5	0.812	0.361	Valid
Rural Development 1.6	0.625	0.361	Valid

The relatively higher mean for IT Services reflects respondents' appreciation for digital accessibility, including internet availability, SID-related software, and digital service features. Meanwhile, human resource capacity scored slightly lower, indicating a possible need for targeted training to improve staff competencies and digital literacy in SID management.

3.1.3 Instrument Validity and Reliability

The research instrument was validated using the Pearson correlation technique. All item correlation coefficients exceeded the minimum threshold ($r > 0.361$), confirming construct validity. Reliability was tested using Cronbach's Alpha, and all constructs surpassed the acceptable limit of 0.70:

- Human Resources (X_1): $\alpha = 0.808$
- Infrastructure (x_2): $\alpha = 0.700$
- IT Services (x_3): $\alpha = 0.732$
- Rural Development Acceleration (Y): $\alpha = 0.808$

Table 6. Validity and Reliability Test Results

Variable	Cronbach's Alpha	Reliability Threshold	Remarks
Human Resources (X1)	0.808	0.60	Reliable
Infrastructure (X2)	0.700	0.60	Reliable
IT Services (X3)	0.732	0.60	Reliable
Rural Development Acceleration (Y)	0.808	0.60	Reliable

These findings demonstrate that the survey instrument was statistically sound and consistent across different dimensions of the SID evaluation framework.

3.1.4 Classical Assumption Testing

Several diagnostic tests were conducted to confirm the appropriateness of the multiple regression model:

- Normality: Kolmogorov–Smirnov test yielded a p-value of 0.181, indicating a normal distribution.
- Linearity: ANOVA tests for deviation from linearity showed p-values > 0.05 for all variables.
- Multicollinearity: Tolerance values were all > 0.9 and VIF < 1.05 , indicating no collinearity concerns.

Heteroskedasticity: Residual plots revealed no visible patterns or funneling.

Figure 1. Scatterplot for Heteroskedasticity Check

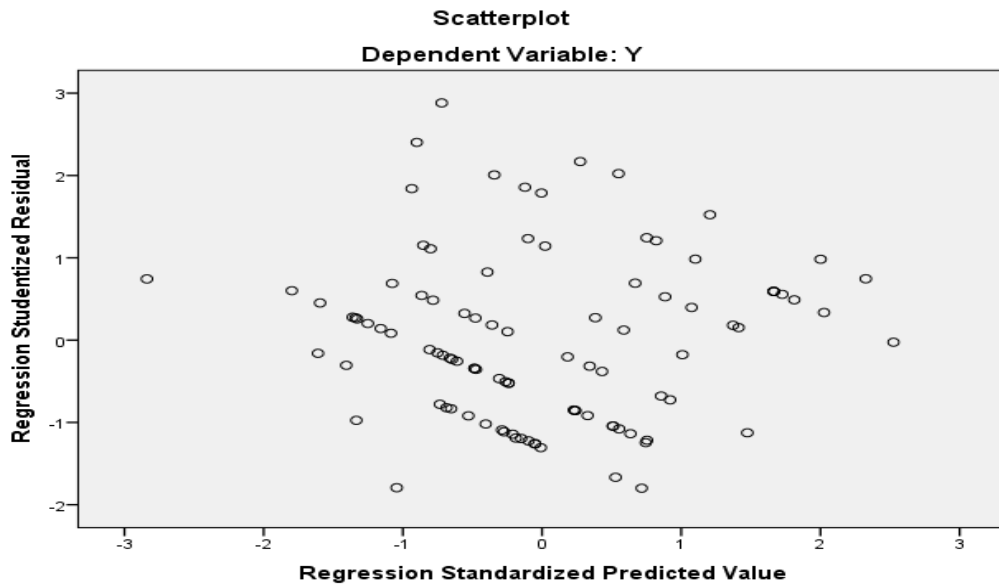


Table 7. Classical Assumption Testing Summary

Assumption	Test Method	Result	Conclusion
Normality	Kolmogorov–Smirnov Test	Sig. = 0.181 (> 0.05)	Normally distributed
Linearity	ANOVA – Deviation from Linearity	Sig. > 0.05 for all variables	Linearity assumed
Multicollinearity	VIF and Tolerance	VIF < 1.05; Tolerance > 0.9	No multicollinearity
Heteroskedasticity	Scatterplot Observation	Random distribution; no funneling pattern	Homoscedasticity assumed

This confirms that the dataset met the required assumptions for regression analysis, validating the robustness of the inferential findings.

3.1.5 Multiple Regression Analysis

The multiple regression model used was:

$$X_1 Y = 48.038 + 0.177x_1 + 0.246x_2 + 0.407x_3$$

Where:

- Y : Acceleration of rural development
- x_1 : Human resources
- x_2 : Infrastructure
- x_3 : IT services

Table 8. Coefficient Estimates from Multiple Regression Analysis

Variable	Unstandardized Coefficient (B)	Standardized Coefficient (Beta)	t-value	Sig. (p-value)	Remarks
Constant	48.038	–	–	–	–
Human Resources (X1)	0.177	0.240	2.580	0.011	Significant
Infrastructure (X2)	0.246	0.325	3.384	0.001	Significant
IT Services (X3)	0.407	0.496	5.656	0.000	Significant

All three independent variables exhibited statistically significant, positive coefficients:

- Human Resources (X1): $\beta = 0.177$, $p = 0.011$
- Infrastructure (X2): $\beta = 0.246$, $p = 0.001$

- IT Services (X3): $\beta = 0.407, p = 0.000$

The strongest influence was exerted by IT Services, indicating that SID's effectiveness in promoting rural development hinges significantly on technical readiness and access.

3.1.6 Hypothesis Testing

Using partial t-tests and a simultaneous F-test:

- **H1:** Human resources positively influence rural development ($t = 2.580; p = 0.011$)
- **H2:** Infrastructure positively influences rural development ($t = 3.384; p = 0.001$)
- **H3:** IT services positively influence rural development ($t = 5.656; p = 0.000$)

Simultaneously:

$F = 15.997; p < 0.001$ — indicating joint significance

Table 9. Hypothesis Testing Summary (t-test and F-test)

Hypothesis	Variable	Test Type	Test Statistic	Sig. (p-value)	Conclusion
H1	Human Resources (X1)	t-test	2.580	0.011	Supported (Significant)
H2	Infrastructure (X2)	t-test	3.384	0.001	Supported (Significant)
H3	IT Services (X3)	t-test	5.656	0.000	Supported (Significant)
H4	X1, X2, X3 → Rural Development (Y)	F-test	15.997	0.000	Supported (Significant)

These results affirm all hypotheses and show that the presence of skilled personnel, reliable infrastructure, and robust digital support systems are indispensable to accelerating rural transformation.

3.2 Discussion

The study's results are consistent with international evidence emphasizing that robust digital infrastructure and skilled human capital are critical for the success of e-governance initiatives. The dominant effect of IT services reinforces the notion that digital transformation should be viewed not merely as a technological upgrade but as a strategic enabler of more transparent, inclusive, and effective local administration (Zhang & Guo, 2024).

In the specific context of Aceh, the SID operates not just as a data management system, but as a vital instrument for local governance. It facilitates transparency in administration, encourages civic engagement, and enhances the efficiency of development planning. The significant role of human resources aligns with Stewardship Theory, which sees local leaders as guardians of public assets and institutional integrity. Infrastructure, while sometimes undervalued, is equally essential—particularly in rural areas where basic digital connectivity is a prerequisite for effective SID deployment.

The combined impact of these three factors suggests the need for an integrated, systems-oriented approach. Isolating one element without strengthening the others would likely lead to suboptimal results. Therefore, a comprehensive strategy that develops human capacity, physical infrastructure, and digital services in parallel is fundamental to fostering accelerated rural development.

4. Conclusion and Recommendations

4.1 Conclusion

This research presents empirical insights into how the Village Information System (SID) contributes to the acceleration of rural development, using the case of Kota Kualasimpang in Aceh Tamiang. Based on survey data from 99 respondents across five villages, the findings indicate that human resources, infrastructure, and IT services each exert a positive and significant influence on the effectiveness of SID in supporting village-level development initiatives.

Among these factors, IT services emerged as the most influential, highlighting the critical role of technological readiness, digital platforms, and reliable internet access in enabling effective village governance. This reinforces the view that digitalization in rural areas must be seen not only as a technical upgrade but as a catalyst for enhancing transparency, service quality, and community empowerment.

The importance of human resources also supports the application of Stewardship Theory, which positions village officials as responsible custodians of public information and services. At the same time, infrastructure remains a foundational element, enabling digital systems to function properly and ensuring that development benefits are distributed equitably across rural populations.

Taken together, the findings suggest that SID implementation is most effective when supported by a synergistic combination of skilled personnel, adequate infrastructure, and high-quality IT services. These elements must be strengthened in a coordinated manner to fully realize the transformative potential of digital governance in rural development.

4.2 Recommendations

Based on the study's outcomes, several strategic steps are recommended to enhance the implementation and impact of the Village Information System (SID) in rural development acceleration:

1. **Strengthening Human Capacity:**

It is essential to enhance the skills and competencies of personnel involved in managing SID. Regular training programs focused on digital literacy, data handling, and system maintenance should be institutionalized to ensure smooth and sustainable system operation. Empowered human resources will be instrumental in embedding SID into routine village governance effectively.

2. **Upgrading Infrastructure:**

Many rural areas still struggle with poor infrastructure, including limited internet access, outdated equipment, and unreliable electricity. Improving both physical and digital infrastructure—particularly in underserved regions—is crucial to unlocking the full potential of SID and bridging the rural digital divide.

3. **Enhancing IT Services:**

Technical support must be responsive and user-friendly. SID applications should have intuitive interfaces, regular maintenance, and performance evaluations. Establishing mechanisms for user feedback will help tailor the system to community needs and enhance its responsiveness.

4. **Promoting Community Engagement:**

Active participation from community members is key to the legitimacy and effective utilization of SID. Public awareness campaigns, inclusive planning processes, and civic education can strengthen trust, encourage usage, and foster accountability in village-level governance.

5. **Institutional Integration and Governance Coordination:**

SID implementation should be embedded within a broader governance framework that promotes vertical coordination among village, subdistrict, and regional authorities. Integrated planning, policy alignment, and shared infrastructure will

ensure the sustainability and scalability of SID as a core component of rural development policy.

References

- Boufounou, P., Eriotis, N., Kounadeas, T., Argyropoulos, P., & Pouloupoulos, J. (2024). Enhancing internal control mechanisms in local government organizations: A crucial step towards mitigating corruption and ensuring economic development. *Economies*, 12(4), 78. <https://doi.org/10.3390/economies12040078>
- Deng, J., Li, X., & Zhang, N. (2024). The impact of digital rural construction on rural revitalization—Empirical evidence from Chinese county panel data. *Agriculture*, 14(11), 1903. <https://doi.org/10.3390/agriculture14111903>
- Kurniawati, F., Syukur, I., & Nurkholidah, S. (2025). Digital transformation of villages in the framework of fiqh siyasah and good governance. *Jurnal Ilmu Hukum Kyadiren*, 7(1), 183–202. <https://doi.org/10.46924/jihk.v7i1.286>
- Ministry of National Development Planning (Bappenas), Republic of Indonesia. (2019). *Low carbon development: A paradigm shift towards a green economy in Indonesia – Full report*. LCDI-Indonesia. <https://lcdi-indonesia.id/wp-content/uploads/2022/03/Low-Carbon-Development-A-Paradigm-Shift-Towards-a-Green-Economy-in-Indonesia-Full-Report-2019.pdf>
- Roza, D. F., Lubis, S. N., Sihombing, L., Kesuma, S. I., & Lubis, A. A. R. D. (2025). Strengthening rural economies through integrated agriculture: Evidence from Southeast Aceh using input–output modeling. *International Journal of Sustainable Development and Planning*, 20(4), 1595–1601. <https://doi.org/10.18280/ijstdp.200421>
- Sangnak, D. (2025). Sustainable tourism development in Thailand: The role of agricultural tourism and government support for SMEs. *Sustainable Futures*, 9, 100782. <https://doi.org/10.1016/j.sfr.2025.100782>
- Sari, V. K. (2024). ICT expansion and human development: Empirical evidence from Indonesia. *Jurnal Perspektif Pembiayaan dan Pembangunan Daerah*, 12(3), 271–284. <https://doi.org/10.22437/ppd.v12i3.32684>
- Sihotang, D. M., Purwandari, B., Eitiveni, I., Putri, M. F., & Hidayanto, A. N. (2023). Factors influencing village information systems adoption in Indonesia: A qualitative study. *Electronic Journal of Information Systems in Developing Countries*, 89(5), Article e12271. <https://doi.org/10.1002/isd2.12271>
- Tahmasebi, F. (2023). The digital divide: A qualitative study of technology access in rural communities. *AI and Tech in Behavioral and Social Sciences*, 1(2), 33–39. <https://doi.org/10.61838/kman.aitech.1.2.6>
- Tolbert, C. J., & Mossberger, K. (2006). The effects of e-government on trust and confidence in government. *Public Administration Review*, 66(3), 354–369. <https://doi.org/10.1111/j.1540-6210.2006.00594.x>
- Wang, J., Liu, K., Yuan, R., Kuang, X., & Qiu, H. (2025). Impact of participation in rural digital governance on grassroots political trust among high-quality farmers—Analysis using survey data from 899 high-quality farmers in Jiangxi Province. *Frontiers in Sustainable Food Systems*, 9, Article 1543354. <https://doi.org/10.3389/fsufs.2025.1543354>
- Wang, P., Li, C., & Huang, C. (2023). The impact of digital village construction on county-level economic growth and its driving mechanisms: Evidence from China. *Agriculture*, 13(10), 1917. <https://doi.org/10.3390/agriculture13101917>