



Building Smart Village Governance Beyond Technology: Evidence from A Participatory Action Research on OpenSID Implementation in Indonesia

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Abstract: This community service program aims to strengthen village governance capacity through mentoring and assistance in implementing the digital Village Information System (OpenSID) as part of Indonesia's Smart Village agenda. The program focuses on improving administrative services, data management, and community participation at the village level. Using a Participatory Action Research (PAR) approach, the program was conducted in Jujun Village and involved village officials, community members, local government representatives, and digital platform developers. The intervention consisted of sequential stages, including policy socialization on the role of the Village Information System in smart governance, capacity-building workshops for village officials, hands-on technical assistance in operating OpenSID, and community outreach to promote SID-based public services. Evaluation was conducted two weeks after implementation using qualitative indicators encompassing knowledge, attitudes, skills, partnership dynamics, and follow-up commitment. The findings indicate improvements in digital literacy and operational capacity among village officials, as well as increased community awareness of digital public services. However, the program also revealed limitations in sustaining digital transformation, particularly related to managerial commitment, leadership-driven institutionalization, and resource ownership. Stakeholder participation was evident but often remained normative rather than transformative. Overall, this community service initiative contributes to ongoing discussions on digital governance and rural development by demonstrating that technology adoption alone is insufficient to achieve smart governance outcomes. Instead, sustained impact depends on participatory capacity building and the development of dynamic managerial capabilities that enable villages to institutionalize digital governance practices over time.

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Introduction

Villages in Indonesia have undergone significant institutional and administrative changes following the enactment of Law Number 6 of 2014 on Villages. This law explicitly mandates the establishment and utilization of a Village Information System (*Sistem Informasi Desa*—SID) as an integral component of village administration, planning, reporting, and public information disclosure (Erida et al., 2023). In line with this regulatory framework, the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration introduced the Smart Village (*Desa Cerdas*) initiative in 2021 as a strategic approach to accelerating sustainable rural development (Saadah et al., 2024).



Despite strong regulatory support, the implementation of digital governance at the village level remains uneven. Although the Village Law stipulates that SID development should be facilitated by regency governments, many local governments have not provided an integrated and operational SID platform. This condition has compelled villages to independently adopt alternative solutions. OpenSID has emerged as one of the most widely used open-source SID platforms due to its accessibility and comprehensive features, including population administration, public service delivery, financial management, and village data analysis (Kusdarini, 2019).

However, empirical conditions in Jujun Village demonstrate that the availability of digital infrastructure alone does not guarantee the realization of smart governance. Although Jujun Village had subscribed to OpenSID and possessed supporting infrastructure such as hosting, domain services, and a renovated service space, the system was primarily utilized for basic information dissemination. There are six pillars of Smart Village, the main intersection of which lies in the Smart Governance pillar. This pillar is represented by three digital government functions: public service, two-sided policymaking process, and apparatus management. The digitalization of these three government functions is very possible with OpenSID, as has been implemented in villages in Indonesia (Taufik, A. R.; Saadah et al., 2025); Jayanti).

As documented in the baseline analysis, although OpenSID can support the deployment of these three tasks, the SG function in Jujun Village is not done digitally. OpenSID in the Jujun village functions solely as a digital display or a static archive, rather than being utilized as an active governance and service tool. This limited utilization was not caused by technological constraints, but by disparities in the dynamic managerial capacity of village officials in adapting and optimizing digital systems. This condition reflects a broader pattern observed in rural digitalization initiatives, where digital systems are present but underutilized due to organizational and managerial constraints (Fitri et al., 2021). One of the key factors underlying this gap is the limited dynamic managerial capacity of village officials. Dynamic managerial capacity refers to the ability of public managers to sense technological and environmental changes, seize digital opportunities, reconfigure organizational processes, and empower stakeholders to support innovation. Drawing from the dynamic capability perspective, this capacity encompasses sensing, seizing, innovating, integrating, and empowering capabilities that enable organizations to adapt and sustain transformation over time (Teece, 2018). In the context of village governance, these capabilities are essential to ensure that SID functions not only as an administrative tool but also as a strategic instrument for implementing Smart Village principles.

Research has shown that SID can enhance transparency, improve service efficiency, and support good governance practices when effectively implemented (Aristoni, 2020; Fitri et al., 2021). Nevertheless, many villages experience difficulties in sustaining SID utilization due to limited human resource capacity, weak managerial readiness, and the absence of structured guidance for integrating digital systems into governance practices (Erida et al., 2023).

Based on the initial needs assessment in Jujun Village, several interrelated problems were identified: limited understanding of Smart Village regulations and indicators, insufficient skills in operating and optimizing OpenSID features, weak integration between village potential and digital planning, and minimal community awareness of SID benefits. These challenges indicate that digital transformation in villages requires not only technical



training, but also a participatory and capacity-oriented approach that addresses managerial, organizational, and social dimensions simultaneously

Previous studies on e-government and village information systems have largely emphasized technical aspects, such as system development, application usability, and transparency outcomes. Research has demonstrated that SID can improve access to public information and support good governance practices when properly implemented (Aristoni, 2020; Fitri et al., 2021). However, fewer studies have addressed the managerial and organizational dimensions required for sustaining digital governance at the village level. Similarly, research on smart governance has predominantly focused on urban contexts and smart city initiatives, often overlooking rural governance settings where institutional capacity and resource constraints differ significantly (Saadah et al., 2024).

Community service programs related to SID implementation have also tended to prioritize technical training and system deployment. While these initiatives contribute to short-term improvements in operational skills, they often fail to address deeper issues related to organizational readiness, adaptive leadership, and long-term sustainability. As a result, many villages experience difficulties in maintaining and optimizing digital systems once external assistance ends, raising concerns about the continuity and effectiveness of digital governance initiatives (Erida et al., 2023).

Based on the problem mentioned above, this community service program was designed to strengthen the dynamic managerial capacity of village officials while optimizing the use of OpenSID to support the implementation of Smart Village pillars. Rather than positioning technology as a standalone solution, the program conceptualizes digital governance as a continuous learning and adaptation process. To achieve this objective, the program adopted a Participatory Action Research (PAR) approach, which emphasizes collaboration between academics, village officials, and community members in diagnosing problems, implementing solutions, and reflecting on outcomes. Through iterative cycles of action and reflection, PAR enables capacity building, local ownership, and sustainable governance transformation, forming the methodological foundation of this study.

To achieve this objective, the program adopted a Participatory Action Research (PAR) approach, which emphasizes collaboration between academics, village officials, and community members in diagnosing problems, implementing solutions, and reflecting on outcomes. PAR is particularly relevant in the context of village governance because it positions local actors as co-creators of change rather than passive recipients of intervention. Through iterative cycles of action and reflection, this approach aims to foster learning, ownership, and adaptive capacity among village stakeholders, thereby supporting the long-term realization of Smart Village governance in Jujun Village. Thus, this community service aims to solve practical problems in the implementation of OpenSID by the Jujun village government in Batanghari Regency through assistance in the implementation of the principles of Smart Village Governance with a dynamic managerial capacity perspective.

Method

This community service program employed a Participatory Action Research (PAR) approach to facilitate the implementation of digital village governance through OpenSID while strengthening the dynamic managerial capacity of village officials. PAR was selected because it emphasizes collaboration between researchers and community members in identifying problems, implementing solutions, and reflecting on outcomes in a continuous and cyclical manner. This approach is particularly relevant in village governance contexts, where



sustainable transformation depends on local ownership, capacity building, and adaptive learning rather than one-time technical interventions (De Oliveira, 2023; Gashi et al., 2023).

The program was conducted in Jujun Village in November 2025, Kerinci Regency, Indonesia. There were 17 training participants consisting of 4 village officials, 2 representatives from the Village Representative Body, 3 RT heads and 8 community members. Jujun had previously adopted OpenSID but had not yet optimized its utilization for smart governance. Based on the initial situational analysis, the main challenges identified included limited understanding of Smart Village regulations, uneven digital competencies among village officials, weak integration of village potential into digital planning, and low community awareness of SID benefits. These findings informed the design of intervention activities and the sequencing of PAR cycles.

The PAR process followed five interrelated stages: (1) problem identification (*to know*), (2) problem understanding (*to understand*), (3) action planning (*to plan*), (4) implementation (*to act*), and (5) reflection and sustainability (*to change*). During the problem identification stage, the research team conducted preliminary meetings and focused discussions with village officials to explore existing governance practices, OpenSID utilization, and perceived challenges. This stage revealed that OpenSID was primarily used for information dissemination and had not been integrated into service delivery or development planning processes.

In the planning stage, intervention strategies were jointly formulated by the service team and village stakeholders. These strategies focused on strengthening dynamic managerial capacity across five dimensions—sensing, seizing, innovating, integrating, and empowering—through targeted training, mentoring, and facilitated discussions. Implementation activities included socialization of Smart Village policies and indicators, hands-on training on OpenSID features, workshops on integrating village potential into digital planning, and community outreach to promote SID utilization. Throughout the process, village officials and community members acted as active participants rather than passive recipients, consistent with the core principles of PAR (Doucet et al., 2022).

Evaluation was conducted using a qualitative-descriptive approach, combining pre- and post-intervention observations, participatory reflections, and monitoring of OpenSID utilization. Changes in knowledge, skills, attitudes, and governance practices were assessed through structured discussions, observation of system use, and follow-up monitoring of village digital activities. This evaluative process allowed the research team and village stakeholders to jointly reflect on progress, challenges, and opportunities for sustainability.

Result and Discussion

The implementation of the community service program produced several significant outcomes related to capacity building, system utilization, and governance practices in Jujun Village. Prior to the intervention, OpenSID utilization was largely limited to basic information dissemination, and village officials demonstrated varying levels of digital literacy and managerial readiness. Following the PAR-based intervention, notable improvements were observed in both the functional use of OpenSID and the dynamic managerial capacity of village officials.

The early phase of the community service program was initiated through remote learning activities conducted via Zoom meetings, focusing on the introduction and technical configuration of the Village Information System (SID). During this stage, the Jujun Village Government demonstrated a relatively high level of enthusiasm and participation. Village



officials actively attended three consecutive online sessions aimed at introducing the overall system architecture, basic operational features, and initial data management procedures. This phase included system setup, introductory navigation, and preliminary discussions on the role of SID in supporting village governance.

Following the introductory sessions, the training progressed to more applied stages, including population data entry and the initial configuration of basic public services, particularly administrative letter services. At this stage, village officials were able to follow instructions and complete several assigned tasks under facilitator guidance. This pattern indicates that, at least in the early stages, the village administration possessed a baseline level of technical readiness and openness to digital tools, particularly when tasks were clearly structured and closely guided by facilitators.

However, as the training entered more complex and autonomous phases, specifically those requiring independent system configuration, decision-making regarding service workflows, and integration of SID into routine governance practices, a noticeable decline in participation and engagement emerged. Village officials became less responsive to follow-up communication, and observable progress in system utilization slowed significantly. Despite continuous follow-up efforts by facilitators and the academic service team, subsequent system development activities did not advance as expected.

The continuation of the community service activities in Jujun Village was carried out on 4 November 2025 and marked a critical phase in translating conceptual capacity building into direct field-based implementation. This phase involved village officials and community members as primary participants and focused on strengthening both conceptual understanding and practical competencies in developing a Smart Village through the utilization of the Village Information System (SID). The on-site activities complemented earlier preparatory and remote interventions, reinforcing the participatory and iterative nature of the adopted Participatory Action Research (PAR) approach.

One of the central activities during the field implementation was the socialization and empowerment of the Jujun Village community regarding the utilization of SID for public service delivery. This activity aimed to enhance community awareness of SID as a public service instrument rather than merely an administrative tool managed exclusively by village officials. Community members were introduced to the practical benefits of SID, including access to population administration services, village information transparency, and more efficient communication between citizens and the village government. This finding aligns with previous studies suggesting that digital governance initiatives are more effective when communities are positioned as active users and beneficiaries rather than passive recipients (Fitri et al., 2021).

The results indicate that community engagement significantly contributed to shifting perceptions of SID from a bureaucratic system to a shared governance platform. This shift is particularly relevant to the Smart People and Smart Government pillars of the Smart Village framework, where digital literacy, participation, and trust in governance systems play a crucial role. Increased awareness among community members also created social pressure and moral incentives for village officials to consistently utilize and maintain the SID, thereby supporting sustainability beyond the duration of the community service program (Erida et al., 2023).

A comparison of management conditions, digital literacy, and governance competence before and after the Participatory Action Research (PAR)-based intervention is shown in Table 2. The comparison shows that although technological knowledge and skills have



significantly increased, the institutionalization of digital governance methods remains limited, especially in the capturing and changing phases of dynamic management capacities.

Table 1. Comparison of Governance and Capacity Conditions in Jujun Village

Aspect	Indicator	Condition Before Intervention	Condition After Intervention
Knowledge	Understanding of Smart Village concept and indicators	Different understandings among village officials; SV is only considered as "technology adoption" without any impact on governance.	Improved understanding of context; SV is believed to be a governance transformation process that can provide public services, community participation, and management bureaucracy.
	Awareness of SID regulatory basis and function	Limited awareness among village officials regarding the village's obligations in implementing the Village Information System; OpenSID is considered optional.	Increasing awareness of SID as a legal mandate and OpenSID can be used to carry out government functions.
Digital Literacy	Ability to operate OpenSID basic features	Unequal digital skills; village officials know how to use basic features like population data input and news content.	Improving the operational skills of all village officials and the community. Village officials are able to manage population data, provide administrative services, and organize correspondence. The community is aware of access to complaints and access to news.
	Ability to optimize OpenSID for governance functions	Very limited; OpenSID used mainly as an information board	Partial optimization; OpenSID began to support administrative services and internal data management
Managerial Capacity (DMC)	Sensing capability (recognizing digital opportunities)	Low-moderate; awareness of digitalization exists but has not been implemented as a strategic step.	Improved; officials acknowledged SID's potential for service efficiency and governance improvement
	Seizing capability (organizational commitment and prioritization)	Weak; there is no official direction from the village head for digital transformation, and digitalization planning is not yet integrated.	Experienced improvement; village officials recognize the potential of SID for the efficiency of their services and improved governance.
	Transforming capability (workflow and routine reconfiguration)	Absent; no changes in service routines or administrative procedures	Initial experimentation observed, but institutionalization not yet achieved
Attitude	Openness of village officials to digital governance	Cautious and dependent on external guidance	More open and confident during assisted implementation, but autonomy still developing
	Community	Community perception of	Increased awareness; SID viewed as a



	perception of SID	SID	public service and information access platform
Participation	Community involvement in SID utilization	Minimal; community largely passive	Improved; community engaged in learning, service access, and monitoring discussions
Governance Practice	Use of SID in public service delivery	Predominantly manual services; SID not integrated	Hybrid model emerging; SID began supporting administrative letter services
	Transparency and information access	Limited and static	Improved access to village information, though still not fully interactive
Partnership	Multi-stakeholder (pentahelix) engagement	Ad hoc and informal	Formalized cooperation involving village government, district actors, university, and SID facilitators
Sustainability Orientation	Institutional ownership of digital transformation	Low; activities perceived as external projects	Moderate awareness of sustainability needs, but ownership still constrained by leadership and budgetary factors

A distinctive feature of this community service activity was the active involvement of pentahelix governance actors, which strengthened the institutional ecosystem supporting Smart Village development. Government actors included the Kerinci Regency Government, Keliling Danau Sub-district administration, and the Jujun Village Government, all of whom play strategic roles in policy continuity and institutional support. Their involvement ensured that the empowerment activities were aligned with broader regional development agendas and increased the likelihood of long-term program sustainability. The presence of multi-level government actors also reinforced vertical coordination, which has been identified as a critical success factor in digital governance implementation at the local level (Saadah et al., 2024).

In addition to formal institutional actors, the role of local facilitators, particularly a village apparatus from Singoan Village, proved to be instrumental in strengthening inter-village learning and horizontal collaboration. The facilitator actively maintained communication and provided informal mentoring to the Jujun Village Government, sharing experiential knowledge on SID implementation and Smart Village practices. This peer-to-peer learning mechanism reduced dependency on external experts and increased contextual relevance, as solutions were grounded in similar administrative and socio-cultural environments. Such horizontal knowledge exchange is consistent with PAR principles, which emphasize co-learning and mutual empowerment among participants (De Oliveira, 2023).

The involvement of higher education institutions, represented by the community service team and student facilitators, further enriched the collaborative ecosystem. Academics contributed theoretical frameworks, methodological rigor, and reflective analysis, while students acted as facilitators and technical assistants during empowerment activities. This arrangement not only enhanced the quality of the service program but also supported experiential learning for students, aligning with the broader objectives of higher education engagement in community development. Previous studies have highlighted the value of university–community partnerships in sustaining innovation and capacity building in rural governance contexts (Gashi et al., 2023).

From a governance perspective, the results demonstrate that Smart Village development requires more than technological readiness. While OpenSID provided a



functional digital platform, its effective utilization depended on the presence of collaborative governance arrangements and adaptive managerial practices. The engagement of pentahelix actors created a supportive environment that enabled village officials to experiment, learn, and gradually integrate SID into governance routines. This finding reinforces the argument that smart governance is fundamentally a socio-institutional process facilitated—but not determined—by technology (Aristoni, 2020).

However, a closer examination of stakeholder engagement during the implementation phase indicates that the involvement of pentahelix actors remained largely normative and procedural, rather than transformative in nature. While representatives from the regency, sub-district, and village governments were physically present during key activities, their participation was primarily confined to formal attendance, ceremonial remarks, and institutional acknowledgment of the program. This form of engagement, although important for legitimacy and symbolic support, did not consistently translate into a shared understanding of the strategic implications of digital governance or concrete follow-up actions required to institutionalize SID utilization within routine governance practices.

The limited depth of engagement suggests that stakeholder presence functioned more as a mechanism of formal compliance and visibility than as an active process of sense-making and strategic alignment. In other words, participation tended to emphasize *being present* rather than *being involved* in shaping the direction, priorities, and responsibilities associated with Smart Village development. As a result, critical questions regarding role distribution, policy integration, budgetary alignment, and long-term governance reform remained insufficiently addressed during and after the activities.

From a governance perspective, this condition reflects a common challenge in multi-stakeholder digital initiatives, where vertical and horizontal coordination exists at the level of representation but has not yet matured into collective ownership and operational commitment. Although multi-level government involvement is often regarded as a prerequisite for sustainability, its effectiveness depends on the extent to which actors internalize the purpose of digital transformation and translate it into institutional mandates, performance expectations, and resource allocation. In the absence of such internalization, digital initiatives risk being perceived as externally driven projects rather than endogenous governance reforms.

This pattern also indicates a gap in the seizing and transforming stages of dynamic managerial capabilities, particularly at the leadership and inter-organizational levels. While the opportunity for digital governance transformation was formally acknowledged through attendance and verbal support, it was not fully seized through decisive leadership actions, such as issuing internal directives, redefining organizational roles, or embedding digital governance objectives into planning and budgeting instruments. Consequently, the potential of SID to function as a strategic governance tool remained underutilized, despite the presence of a supportive institutional environment.

Importantly, this finding should not be interpreted as resistance or indifference on the part of stakeholders. Rather, it reflects the persistence of conventional administrative practices, where innovation is often approached as an *event* rather than a *process*. The transition from symbolic participation to substantive engagement requires time, iterative learning, and deliberate facilitation that enables stakeholders to move beyond formal roles toward shared accountability for outcomes.

Overall, the normative nature of stakeholder involvement underscores the need for future community service interventions to complement multi-stakeholder presence with structured mechanisms for strategic reflection, role clarification, and commitment-building.



Such mechanisms are essential to transform physical attendance into meaningful engagement and to ensure that Smart Village initiatives evolve into sustained digital governance practices rather than remaining episodic empowerment activities.

Additionally, from the perspective of Dynamic Managerial Capabilities (DMC), this pattern suggests a capability discontinuity rather than an outright absence of capacity. In other words, the village government did not entirely lack digital or managerial capability; instead, the transformation process appears to have stalled at specific stages of the dynamic capability cycle.

The modified DMCcycle below illustrates how digital governance transformation in Desa Jujun progressed unevenly across different capability stages. Rather than indicating a complete absence of managerial or digital capacity, the cycle reveals a capability discontinuity, where transformation stalled at a critical transition point. The diagram illustrates a capability discontinuity between the sensing and seizing stages, indicating that while digital opportunities were recognized, organizational commitment and institutionalization remained limited, constraining subsequent transforming and empowering capabilities.

This modified DMC cycle demonstrates that digital governance failure should not be interpreted as incapacity, but as a misalignment across capability stages. In Desa Jujun, the transformation process was interrupted between sensing and seizing, preventing downstream capabilities from fully developing.



Figure 1. Modified Dynamic Managerial Capability (DMC) Cycle in Jujun Village

Drawing on the dynamic capability framework (Teece, 2018), managerial capability development typically unfolds across several interrelated stages: sensing, seizing, transforming (or reconfiguring), and empowering/institutionalizing. Based on the empirical observations from this program, the interruption appears to occur between the sensing and seizing stages, with implications extending into the transforming stage.

At the sensing stage, organizations recognize opportunities and external changes that necessitate adaptation. In this case, the initial enthusiasm observed during the introductory Zoom sessions indicates that the village government was able to *sense* the relevance of digital governance and SID implementation. Participation in early training sessions suggests an awareness that SID could potentially improve administrative efficiency and service delivery.

However, the transition to the seizing stage, which requires organizational commitment, resource mobilization, and prioritization of innovation, appears to be only partially realized. Although village leaders expressed general support for the program, this support remained largely symbolic and facilitative, rather than directive or transformational. Leadership endorsement was reflected in allowing the use of village facilities and ensuring physical attendance during offline activities, but it did not translate into explicit institutional



mandates, performance expectations, or internal policy adjustments that would compel organizational change.

This condition is particularly significant in the context of village governance, where the village head functions as the central strategic actor. Vision-setting, prioritization, and enforcement of organizational change largely depend on top-level leadership. Without formal directives or embedded expectations from the village head, individual village officials may lack both the authority and motivation to sustain transformation efforts independently. Consequently, digital transformation initiatives risk being perceived as external projects rather than integral components of village governance reform.

Another critical factor influencing the seizing stage relates to resource commitment, particularly financial ownership. In this program, all costs associated with digital transformation—including training, facilitation, and system optimization—were fully supported by the university. While this arrangement effectively reduced financial barriers to participation, it may have unintentionally limited the development of institutional ownership.

From an organizational change perspective, financial commitment often functions not only as a resource input but also as a signal of political will and strategic priority. The absence of budgetary allocation from the village government may indicate that digital transformation had not yet been internalized as a core development agenda. Importantly, this observation should not be interpreted as resistance or negligence, but rather as a reflection of competing priorities and limited fiscal space commonly faced by village governments.

The lack of direct financial investment may have constrained the transition from seizing to transforming capabilities, where organizations begin to reconfigure routines, redistribute responsibilities, and embed innovation into daily practices. Without internal budgetary support or formal policy instruments, transformation remains dependent on external facilitation and is therefore vulnerable to stagnation once external support diminishes.

The observed stagnation also suggests that transforming and empowering capabilities had not yet fully emerged. Transforming capability requires organizations to restructure workflows, redefine roles, and align technology with governance objectives. Empowering capability further extends this process by enabling actors at multiple levels to take ownership of innovation and sustain change over time.

In the case of Jujun Village, village officials demonstrated the ability to perform assigned technical tasks under close supervision but encountered difficulties when required to independently advance system implementation. This pattern indicates that capacity development had not yet progressed from *assisted execution* to *self-directed transformation*. Such a condition is not uncommon in early-stage digital governance initiatives and underscores the importance of leadership-driven institutionalization.

Importantly, these findings should not be interpreted as a failure of the village government or a lack of goodwill among village officials. Rather, they reflect the structural and political realities of village governance, where transformational change requires alignment between technical capacity, managerial readiness, leadership vision, and resource commitment. The observed capability gap highlights the need for stronger integration between leadership vision and operational capacity, rather than attributing stagnation to individual attitudes or competencies.

From a community service perspective, this finding provides valuable insight into the conditions under which digital governance initiatives can be sustained. It suggests that future interventions should place greater emphasis on leadership engagement, formal institutional



commitments, and gradual internalization of innovation costs to strengthen the seizing and transforming stages of dynamic managerial capability development.

Nevertheless, several challenges remain. Although awareness and skills improved, variations in digital literacy among village officials and community members persisted. Sustaining SID utilization will require continued mentoring, periodic evaluation, and policy support from higher levels of government. Additionally, while progress was evident in the Smart Government and Smart People pillars, the integration of other Smart Village pillars—such as Smart Economy and Smart Environment—remains a longer-term endeavor that necessitates further capacity development and cross-sector collaboration.

Overall, the extended field-based implementation on 4 November 2025 demonstrates that participatory, multi-actor, and capacity-oriented approaches can effectively bridge the gap between digital infrastructure availability and meaningful governance transformation. By embedding dynamic managerial capacity within both the service team and village institutions, the program fostered adaptive learning, collaboration, and ownership among stakeholders. These outcomes underscore the importance of positioning community service not merely as a transfer of technology, but as a structured process of governance transformation toward the realization of a Smart Village in Jujun Village.

This community service program demonstrates that the implementation of digital village governance through SID is not solely a technical or administrative endeavor, but a governance transformation process that requires substantive leadership engagement, institutional commitment, and multi-stakeholder ownership. While the presence of pentahelix actors—government institutions at various levels, private technology developers, higher education institutions, and community representatives—provided formal legitimacy and symbolic support for Smart Village initiatives, the findings reveal that such involvement often remained normative rather than transformative.

Conclusion

This community service program effectively enhanced participants' comprehension of the urgency, regulatory framework, and governance metrics associated with the Smart Village idea. It enhanced the fundamental operational capabilities of village officials in employing OpenSID for administrative services and information management. Community awareness of SID as a public service tool has also risen, signifying advancements in participatory digital governance at the village level. Nevertheless, the initiative faced constraints in progressing towards autonomous, continuous system utilization, primarily due to the restricted autonomy of human resources in overseeing more intricate OpenSID functionalities and the lack of strong institutionalization processes.

The results indicate that digital governance initiatives cannot depend exclusively on technical training or the involvement of stakeholders. Community service and empowerment programs must specifically target the grabbing and changing phases of dynamic management capacities, wherever organizational commitment, leadership guidance, and regular reconfiguration are critical. In the absence of these features, digital efforts are likely to stagnate following initial adoption. The experience of Jujun Village demonstrates that the success of Smart Village implementation depends not merely on technological readiness but on the depth of institutional commitment and managerial adaptation. Enhancing leadership involvement, integrating digital goals into village planning and budgeting, and fostering progressive internal ownership are crucial for converting Smart Village initiatives from temporary empowerment efforts into enduring governance reforms.



Recommendation

Based on the empirical findings and analytical reflections from the implementation of this community service program, the following recommendations are proposed to strengthen the sustainability and governance impact of digital village transformation initiatives:

1. Digital initiatives should be institutionalized through adjustments to workflows, service procedures, and administrative routines. Policies that support incremental organizational restructuring can facilitate the transition from assisted system use to autonomous and sustained digital governance practices.
2. While external funding is effective at the initiation stage, sustainable transformation requires gradual budgetary ownership by village governments. Policy designs that promote phased financial commitment can strengthen institutional responsibility without imposing immediate fiscal pressure.
3. Digital governance policies should emphasize leadership actions such as issuing internal directives, integrating digital objectives into village development plans, and assigning clear responsibilities to village officials to support institutional change.

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