

Implementing Smart Village to Strengthen Digital Economy in Rural Bone Regency

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ABSTRACT

This study aims to examine the implementation of Smart Village in strengthening the village's digital economy, with a case study in Desa Data, Mare District, Bone Regency. Using a qualitative case study approach and thematic analysis of data from in-depth interviews, observations, and supporting documents, this study found that digital transformation has begun to penetrate the village level through the use of social media by micro-entrepreneurs, village officials, and the general public. The use of digital technology, particularly for business promotion and networking, has improved connectivity between MSME actors and customers, expanded market access, and built the confidence of local business actors. However, technology adoption is still constrained by promotional factors and has not been fully integrated into digital transaction systems. The main challenges include limited network infrastructure, digital literacy, and community participation. Family and village government support in digital training greatly helps the technology adoption process. However, the sustainability and effectiveness of programs still need to be strengthened through a more comprehensive digitalization roadmap. This study suggests the need for cross-actor collaboration, local institutional capacity-building, and the development of community-based digital village ecosystems to realize inclusive, adaptive smart villages. Policy recommendations and future research directions are also presented to accelerate the digital transformation of villages in Indonesia.

Keywords

Digital Transformation, MSMEs, Smart Village, Village Digital Economy.

Introduction

Digital transformation has become a strategic foundation for village development in the digital economy era (Câne, 2021; Kosasih & Sulaiman, 2024), in line with the national vision of creating equitable development and local economic independence (Aminah & Saksono, 2021; Ikbal et al., 2025; Ilham et al., 2023; Saputra et al., 2023). One innovation being promoted at the national level is the concept of Smart Villages, a village development strategy based on the use of information and communication technology to support governance, public services, and the strengthening of the local economy and social inclusion (Doloi, 2025; Komorowski & Stanny, 2020; Patnaik et al., 2020).

This national agenda aligns with Indonesia's Digital Village (Desa Cerdas) program, initiated by the Ministry of Village Affairs, Development of Disadvantaged Regions, and Transmigration (Kementerian Desa Dan Pembangunan Daerah Tertinggal Republik Indonesia, 2021). Through the Desa Cerdas roadmap (2021–2024), Kemendes PDTT promotes digital inclusion in village governance, MSME digitalization, and local innovation ecosystems to accelerate the achievement of SDGs (Panduan Umum Pengembangan Desa Cerdas, 2024). Empirical evidence from pilot villages such as Banyuwangi, Sleman, and Bone demonstrates that Desa Cerdas initiatives—covering online administration, village marketplace development, and public Wi-Fi provision—have improved transparency and supported inclusive economic growth.

The Ministry of Village, Regional Development, and Transmigration (Kemendes PDTT) reports that by 2023, more than 2,000 villages have adopted digital services, ranging from online-based administrative systems, promotion of MSMEs through online platforms, to village information management based on websites (Kementerian Desa PDTT, 2023; Yulianti et al., 2024). However, the adoption of Smart Villages in Indonesia still faces several critical challenges (Hadian & Susanto, 2022; Latupeirissa et al., 2023; Yoraeni et al., 2022), such as limited digital infrastructure, low digital literacy among the population, and technology integration that has not yet addressed the holistic strengthening of the village digital economy (Dirgatama et al., 2024; Kurniawan, 2022; Maulana et al., 2024; Yanti, 2024). These issues indicate that while the Desa Cerdas policy provides a national framework for digital village transformation, its local implementation remains fragmented and dependent on village initiative, infrastructure readiness, and institutional capacity. Bridging this gap between policy design and local practice is crucial for realizing sustainable digital economies in rural Indonesia.

Data from the Central Statistics Agency in 2022 even indicates that only around 28% of rural residents possess basic digital skills, while internet access in many remote villages remains severely limited (Badan Pusat Statistik, 2022). Bone Regency in South Sulawesi is one of the regions beginning to show signs of rural digital transformation, comprising 333 villages across 27 districts. It is known for its

“Merdeka with Digitalization” initiative in 2024 (BPS Kabupaten Bone, 2024). One of the villages, Desa Data Kecamatan Mare, has developed an official website (<https://data.digitaldesa.id>) that serves as an information platform and digital promotion system for local products such as seaweed and handicrafts (Desa Data, 2023). However, the utilization of technology to support the digital economy in villages remains partial, not yet integrated into a sustainable policy framework, and faces challenges related to literacy and institutional readiness.

Previous literature, both at the international and national levels, highlights that successful innovative village approaches in Europe and Asia (European Network for Rural Development (ENRD), 2018; Fang et al., 2024; Liu & Wang, 2023; Patnaik et al., 2020) generally focus on providing infrastructure and basic services, but have not given sufficient space to strengthening community-based digital economies. In Indonesia, several studies emphasize the importance of digitalization in village public services but often rely on macro- and administrative-level approaches without delving deeply into the experiences of communities and village economic actors (Faozanudin et al., 2023; Made & Kurniawan, 2021; Susano, 2023; Susilowati et al., 2023). Meanwhile, research on the digitization of village MSMEs tends to focus on the individual use of social media and e-commerce, without systematically linking it to innovative village policies or the broader digital economy ecosystem (Aji & Wiwit, 2024; Arrizqi, 2023; Novitasari, 2022; Prilosadoso et al., 2024). Thus, there is a clear research gap, namely the need for studies that combine a systemic framework (Smart Village Framework) with a community-based approach (Community-Based Digital Economy Model) simultaneously to capture the complexity of digital transformation in villages in the local Indonesian context (European Network for Rural Development (ENRD), 2018; Suyatna et al., 2024).

This study is designed to bridge the gap between national policies and implementation realities at the village level, and to provide a holistic understanding of the role of Smart Villages in strengthening community-based digital economies. The study is conducted in Desa Data, Mare District, Bone Regency, which has been a pioneer in website-based digitalization and local product promotion, but also faces challenges related to literacy, infrastructure, and institutional collaboration. Thus, the two main questions this study seeks to answer are: (1) How is the Smart Village concept implemented to support the strengthening of the digital economy at the village level? and (2) What are the supporting and inhibiting factors in the process of village-based digital economic transformation?

Theoretically, this study adopts a combination of the Smart Village Framework (SVF)—which emphasizes the integration of technology in governance, public services, education, and the village economy (European Network for Rural Development (ENRD), 2018)—and the Community-Based Digital Economy Model (CDEM), which focuses on the digital capacity of the community, access to digital platforms, and local institutional support (Suyatna et al., 2024). The integration of

these two frameworks is expected to provide a holistic and in-depth analysis of the digital transformation phenomenon in villages, not only from the perspective of macro policies but also from the micro dynamics of communities. The main innovation of this research is the use of a phenomenological qualitative approach to capture, in a participatory manner, the narratives, experiences, and practices of economic actors and villagers, thereby generating evidence-based recommendations relevant and applicable to the development of more contextually and inclusively designed smart villages in Indonesia. With these contributions, the research findings are expected to strengthen community-based digital transformation policies and enrich the scientific literature on innovative village development strategies and local digital economies, particularly in non-metropolitan areas transitioning toward sustainable digital ecosystems.

Method

This study uses a qualitative case study design (Yin, 2018) to gain an in-depth understanding of the implementation of the Smart Village concept to strengthen the digital economy in Data Village, Mare District, Bone Regency. Data collection was conducted through triangulation, including in-depth interviews, participatory observation, and documentation. In-depth face-to-face and online interviews were conducted with various key informants, including village officials, local MSME actors, village website managers, village youth, and users of village digital services. Informants were selected purposively based on their roles and involvement in the village's digital and economic transformation to obtain representative data from various perspectives.

A total of 20 informants participated in the research. Data saturation was reached when additional interviews yielded no new insights into digital adoption patterns, training participation, or village economic activities. Table 1 presents the demographic profile and roles of the informants.

Table 1. The Demographic Profile and Roles of the Informants

No	Category / Role	Gender	Age Range	Remarks
1 – 4	Village officials (head, secretary, staff)	M/F	30–50	Responsible for Smart Village administration
5 – 10	MSME owners/entrepreneurs	M/F	25–45	Engaged in the food, handicraft, and seaweed sectors
11 – 13	Village website & ICT managers	M	25–35	Operate and maintain the village portal
14 – 16	Village youth digital volunteers	M/F	20–30	Support training and promotion activities
17 – 20	Users of village digital services	M/F	25–50	Active citizens and consumers

These informants reflect the diverse stakeholders involved in village digitalization and provide multi-angle perspectives needed for a holistic understanding of Smart Village implementation. During the interview process, researchers used semi-structured guidelines to explore informants' experiences, perceptions, challenges, and expectations regarding digital technology adoption, village website management, local product promotion, and inter-institutional collaboration efforts. Participatory observation was conducted by visiting economic activity centers and digital facilities in the village, observing residents' interactions with technology-based services, and documenting the use of applications, websites, and digital promotional activities of village MSMEs. Additionally, researchers collected secondary data from policy documents, village reports, internet usage statistics, and digital promotional materials available on the village website and social media platforms.

All data obtained were analyzed thematically using manual coding techniques, including stages of data reduction, theme categorization, interpretation, and triangulation across data sources (Braun & Clarke, 2006). The coding process followed three analytic phases: 1) Initial coding, identifying key phrases such as "online promotion," "family support," and "network constraints," 2) Focused coding, grouping similar codes into sub-themes (e.g., utilization of technology by residents, economic impact & changes in business patterns, the role of families, communities, and village governments), and 3) Theme construction, integrating sub-themes into four main themes: (1) access and impact of digital technology, (2) support and strategies, (3) barriers and community participation, and (4) plans for digital ecosystems. These themes were refined through peer debriefing among the research team to ensure conceptual clarity and reduce individual bias.

The researchers are faculty members of Universitas Cahaya Prima who have been involved in community-based digital literacy programs in Bone Regency since 2022. This insider status facilitated access to participants and contextual understanding but also required reflexive awareness to avoid normative assumptions about digital progress. To minimize bias, field notes and interview interpretations were cross-checked among team members and validated through follow-up discussions with village stakeholders. Data validity was ensured through triangulation between sources (interviews, observations, and documents) and member checking with selected informants to confirm the accuracy of interpretations. The analysis results were then used to formulate policy recommendations for the sustainable development of smart villages in the local Indonesian context.

Result and Discussion

To facilitate a clearer understanding of the empirical findings, this section summarizes the main themes that emerged from the thematic analysis. The data

were coded inductively from interview transcripts, observation notes, and supporting documents, resulting in four dominant themes that capture the dynamics of digital transformation in Data Village. Specific indicators and selected participants represent each theme, with quotes that illustrate informants' lived experiences and perceptions.

Table 1. Summary of Themes, Indicators, and Sample Quotes

Theme	Empirical Indicators	Representative Quotes from Informants
1. Access, Utilization, and Impact of Digital Technology	Use of social media for promotion, market expansion, and increased confidence in technology use.	"Now, promotion through the village WhatsApp group is very effective, and customers are more aware of the products I sell." (AA, MSME owner)
2. Support, Strategies, and Obstacles in Village Digital Economy	Family mentoring, village training support; limited institutional capacity of BUMDes.	"My child helped me create a Facebook account and taught me how to upload products." (SN, MSME owner)
3. Infrastructure Barriers and Community Participation	Weak network coverage, budget constraints, low discipline, and passive participation.	"The internet often disconnects, so online promotions aren't always effective." (RN, grocery store owner)
4. Plans to Strengthen the Village Digital Ecosystem	Future training plans, expectations for Wi-Fi access, and integrated platform vision.	"If the infrastructure is complete, we can create an online village market like in the city." (RN, grocery store owner)

Source: Author Analysis (2025)

As shown in Table 1, the qualitative data reveal a coherent pattern in which digital adoption at the village level begins with individual initiatives and gradually evolves into community-driven digital practices.

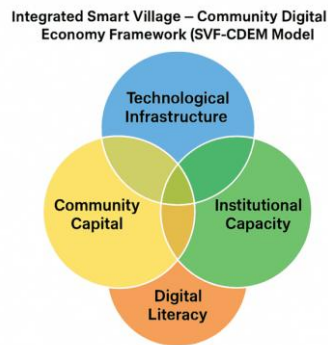
Building upon the thematic findings summarized in Table 1, the following analytical model integrates the Smart Village Framework (SVF) and the Community-Based Digital Economy Model (CDEM) to conceptualize how technological, institutional, and social dimensions interact in rural digital transformation. These illustrate that digital transformation in rural Indonesia must be viewed as a socially negotiated process—where technological adoption depends on perceived benefits, trust, and institutional legitimacy. Hence, SVF and CDEM together form a hybrid analytical lens: SVF explains structural readiness, while CDEM explains social readiness. The integration of these models produces a conceptual synthesis:

- 1) Technological Infrastructure → provides access and tools.
- 2) Institutional Capacity → ensures coordination and policy continuity.
- 3) Community Capital → fosters participation and collective learning.
- 4) Digital Literacy → bridges the structural and social dimensions.

As illustrated in Figure 2, integrating SVF and CDEM reveals that successful digital transformation in rural areas depends not only on technology provision but also on community readiness and institutional collaboration. Technological

infrastructure and governance capacity establish the structural foundation, while social capital and digital literacy ensure adaptability, trust, and long-term engagement.

Figure 1. Integrated Smart Village–Community Digital Economy Framework (SVF–CDEM Model)



1. Access, Utilization, and Impact of Digital Technology

a. Utilization of Technology by Residents

Most economic actors in the village have started using digital technology, especially through social media such as Facebook and WhatsApp, since 2024. This utilization is not only limited to promotion but also to expanding business networks and reaching customers outside the village.

Respondents emphasized that social media has become the primary tool for introducing products and services, as well as for increasing the competitiveness of small businesses in local environments and neighboring villages. The following are various statements that represent the experiences of business actors:

"I usually use Facebook and WhatsApp social media." (IMS, business owner)

"Now, promotion through the village WhatsApp group is very effective, and customers are more aware of the products I sell." (AA, business owner)

"I upload products to Facebook, and sometimes I get buyers from outside the village." (SN, MSME owner)

"In the past, I only put up banners in front of my house, but now I promote online more often." (RN, grocery store owner)

"Social media is cheap and easy for everyone in the village to use." (HF, snack seller)

These findings confirm that digital transformation has reached villages and changed the promotional patterns of micro businesses. Although most utilization is still focused on promotion rather than full digital transactions, residents are already seeing tangible benefits, such as increased business visibility, expanded markets, and growing confidence among local business owners to leverage technology. The widespread use of social media also indicates a shift in marketing culture, where villagers are now more active and creative in promoting their products while strengthening local socio-economic networks.

b. Economic Impact & Changes in Business Patterns

The adoption of digital technology in villages has brought about real changes, not only in how businesses promote themselves but also in income and customer numbers. Several informants reported an increase in customer numbers after they began promoting their products through digital channels. However, implementation is still limited to social media, rather than e-commerce platforms or digital transaction applications. Several business actors and village officials highlighted the benefits and challenges of this process:

"Yes, there have been changes in income, number of customers, or promotion after participating in village digitalization." (IMS, business owner)

"Before, customers were only neighbors; now sometimes there are orders from outside the village." (NS, SME operator)

"Online promotions attract more buyers, but payments are still mostly cash, not fully digital yet." (RN, grocery store owner)

"After promoting through Facebook, my cake sales have increased significantly." (NK, food business owner)

"Customers are becoming more aware of our products, though purchases sometimes still require in-person meetings." (AA, business owner)

This sub-theme shows that village digitalization is beginning to impact local economic aspects. Business owners directly feel an increase in customer numbers and income, although technology use remains limited to promotional activities. Looking ahead, the challenge for village administrators and SMEs is to expand the use of digital technology not only as a promotional tool but also as a more integrated transaction system (e.g., digital payments, marketplace marketing). With increasing digital literacy and a willingness to try new technologies, the potential to accelerate the village economy into the digital realm will grow significantly and become more inclusive.

2. Support, Strategies, and Obstacles to the Digital Economy in Villages

a. The Role of Families, Communities, and Village Governments

Support for learning and adapting to digital technology in villages comes primarily from the immediate circle —family and friends —and from training initiatives by the village government. The role of the family is crucial, both in teaching residents to use everyday technology and in encouraging them to try digital promotion. In addition, some village governments have made efforts to facilitate the training or socialization of digital technology for residents, although the scale and continuity remain limited. These diverse experiences are reflected in the following quotes from various informants:

"My child helped me create a Facebook account and taught me how to upload products." (SN, MSME owner)

"A short training from the village helped us learn about the WhatsApp application and how to promote online." (RN, grocery store owner)

"We in Data village have conducted training for residents." (IL, Home seller)

"I was hesitant at first, but after being encouraged by my family, I dared to try promoting through social media." (HF, snack seller)

This sub-theme emphasizes the important role of family and community environment in the digital adaptation process in villages. Families are the main agents of digital knowledge transfer, while training from the village government serves as a bridge to introduce technology. However, to ensure the sustainability of digital transformation, more systematic and collaborative support is needed from all parties, including the community, village government, and local institutions, so that digitization programs do not remain individual initiatives but become a collective, sustainable movement.

b. Digitalization Program Strategies & Implementation

Some villages already have official websites and information systems that support information dissemination and digital promotion. However, the use of technology to support the digital economy is still minimal. The innovations that are underway are generally only at the promotional stage and have not yet reached the stage of digital transaction systems or full online market integration. BUMDes in several locations have not yet implemented digitalization programs; most still operate manually, especially for savings and loan services or financial administration. The following are some quotes from informants that reinforce these findings:

"We already have a village website and have conducted training for residents." (IL, Home seller)

"Our BUMDes is only involved in savings and loans, still manually, with no digital system." (SO, BUMDes Employee)

"The village website is only used for information and promotion, not yet for transactions." (AR, village official)

"Most village businesses are still promoting through social media, not yet daring to conduct digital transactions." (NK, food business owner)

This sub-theme shows that digitalization strategies in villages are generally still partial and tend to focus on information or promotion. The sub-optimal utilization of village websites and BUMDes digital systems indicates that the development of the digital economy at the village level still requires further support through advanced training, infrastructure strengthening, and the development of a realistic and participatory digitalization roadmap. The following steps are to drive the transformation from mere promotion to an integrated digital transaction system, ensuring that the economic benefits of digitalization are more equitable and profound.

3. Infrastructure Barriers & Community Participation

a. Network, Infrastructure, and Literacy Constraints

The main barriers to rural digital economic development are not only technological issues, but also limitations in basic infrastructure, such as unstable internet networks, inadequate road access, and limited digital literacy at the community level. When the internet is problematic, all digital activities, including promotion, training, and transactions, are hampered. In addition, the limited budget of villages and village-owned enterprises (BUMDes) for investment in digital

infrastructure is a further obstacle to expanding access and innovation. The following quotes illustrate these challenges:

"The main obstacles are inadequate networks and road access." (Indah Mutiara Sari)

"Network issues." (IL, Home seller)

"Budget constraints allocated by BUMDes." (SO, BUMDES Employee)

"The internet often disconnects, so online promotions aren't always effective." (RN, grocery store owner)

"In our village, the signal is weak, so we sometimes have to go to the village center for Wi-Fi access." (SN, MSME owner)

"Many residents are still not accustomed to using digital applications." (HF, snack seller)

These findings confirm that digital infrastructure and literacy are key prerequisites for the success of technology-based rural economic transformation. Without stable networks, effective training, and adequate budgetary support, digital innovation will struggle to flourish. This issue needs to be prioritized by both the village government and external parties who want to promote digitalization in villages. Continuous training and infrastructure provision must go hand in hand to prevent a digital divide in the community.

b. Community Participation & Discipline

Community participation in village digitalization programs is still relatively low. Active individuals drive many digital initiatives, while the general public remains passive or waits for others' success stories. Additionally, challenges arise regarding discipline—whether in attending training, using digital programs, or fulfilling loan repayment obligations at BUMDes. The "wait-and-see" attitude or lack of collective involvement causes digital programs to progress slowly and their impact to remain limited. The following statements from informants illustrate these varied experiences:

"The way to encourage people to join and be active is through their own will. ... not many are enthusiastic about participating in digital training" (AR, village official)

"The challenge we face is the community's discipline in paying according to schedule. So far, there have been no digitalization programs managed by BUMDES" (SO, BUMDES Employee)

"Only a few residents regularly use social media for business; most are just spectators." (NK, food business owner)

This sub-theme shows that the success of village digitalization depends heavily on community participation and discipline. Without active involvement from residents, digitalization programs will remain mere slogans or administrative routines, with no tangible impact. Strategies for community engagement, collective motivation, and the demonstration of direct benefits are needed to encourage greater active participation. The role of successful examples from local individuals or initiators is also crucial in driving collective behavioral change at the village level.

4. Plan to Strengthen the Digital Ecosystem in Villages

Amidst ongoing challenges and limitations, there is great hope among village stakeholders that in the future, all elements—including village-owned enterprises (BUMDes), village officials, and the community—will be more active in organizing digital training and strengthening technological infrastructure. Residents and village

administrators hope that stable internet connectivity and practical training programs will encourage the use of village websites, online promotional apps, and more comprehensive digital transformation. In addition to promotion, village websites are expected to serve as economic platforms that reach markets beyond the region. The following are some statements from informants representing their hopes and plans for strengthening the village's digital ecosystem:

"The plan is to provide training to BUMDes administrators to learn about digitalization. ... If there is a Wi-Fi network, we will try to make it happen" (SO, BUMDES Employee)

"The community can use the village website to promote the village outside the region." (IL, Home seller)

"I hope that digital training is not only for village officials, but also for all residents who have businesses." (IMS, business owner)

"It is very important to improve the quality of the network so that internet access is smooth in all hamlets." (AR, village official)

"If the infrastructure is complete, we can create an online village market like in the city." (RN, grocery store owner)

These findings indicate collective awareness among village actors of the importance of improving digital capacity and infrastructure as the foundation for more inclusive, adaptive village economic development. High hopes are pinned on the sustainability of digital training, improvements in network quality, and the development of village websites/applications as centers for information, promotion, and transactions. To build a strong digital ecosystem, collaboration among actors—village governments, village-owned enterprises (BUMDes), community members, and external stakeholders—is essential to ensure that digital transformation is not just a short-term agenda but is deeply rooted in the village's economic culture and delivers tangible benefits to the community.

This research finding confirms that digital transformation has begun to penetrate rural areas and bring about tangible changes in local economic patterns, particularly in Data Village, Mare Subdistrict, Bone Regency. One of the most evident indicators is the increasing use of digital technology, especially social media such as Facebook and WhatsApp, by micro-entrepreneurs and the general public. This trend reinforces the findings of Made & Kurniawan (2021) and Prilosadoso et al. (2024), who emphasize that adopting information technology is an important initial step in accelerating villages' digital economies.

In line with the findings of Komorowski & Stanny (2020) and Patnaik et al. (2020), the use of social media at the village community level has transformed from a mere communication tool into a primary instrument for promotion, marketing, and even building cross-village and cross-regional socio-economic networks. In Sub-Theme 1.1, the majority of business actors and MSMEs emphasized that social media is now the primary channel for introducing products, reaching new customers, and expanding market access. This phenomenon supports the ideas of Faozanudin et al. (2023) and Susano (2023) about the importance of digital literacy and the strengthening of social networks in innovative village development. Studies by

Lomnitz & Sheinbaum (2004) and Son & Niehm (2021) also found that collective use of social media can enhance the visibility of local businesses, strengthen networks among economic actors, and build market trust that was previously dominated by conventional interactions.

However, compared to the Smart Village Framework (SVF) as applied in Europe (European Network for Rural Development (ENRD), 2018; Komorowski & Stanny, 2020), where digital transformation is driven by institutional coordination and integrated service platforms, the case of Data Village in Bone reveals a distinct trajectory: digital adoption begins from the grassroots—community-led social media initiatives—while institutional readiness remains low. This explains why digital promotion is more dominant than full digital transactions. The institutional framework (village administration, BUMDes) lacks the infrastructure, regulatory capacity, and technical human resources necessary to sustain an integrated digital economy. Hence, the asymmetry between technological enthusiasm and institutional capability constitutes a defining feature of rural digitalization in developing contexts such as Indonesia.

Sub-theme 1.2 emphasizes that technology adoption has a tangible impact on income and customer numbers, although limitations in digital transactions remain significant. Informants from food businesses, grocery stores, and other SMEs directly reported increased turnover and market expansion. This reinforces the existing literature, which emphasizes that digitalization is not merely about adopting devices but also involves changes in local production and consumption patterns (Ilham et al., 2023). However, unlike the findings of Faozanudin et al. (2023) and Susano (2023) in Java, digitalization in Data Bone Village remains focused on marketing activities, with transactions and payments still predominantly cash-based. This reflects a transitional phase of digital maturity, where communities innovate with the tools at hand (such as social media), while institutional systems—such as digital payments, BUMDes marketplaces, and ICT policies—lag behind. From the SVF perspective, this stage corresponds to partial smartness, while from the CDEM viewpoint, it demonstrates strong social capital but weak digital institutionalization. Therefore, integrating SVF and CDEM enables this research to conceptualize smart village transformation not as a linear progression but as a negotiated process between technology systems and community capacity (Prilosadoso et al., 2024).

In Theme 2, the discussion focused on the importance of social ecosystem support—family, community, village government, and training—in the digital adaptation process. This study shows that the process of learning technology in villages almost always begins with informal knowledge transfer within families or close friends. These findings support Son & Niehm's (2021) research, which highlights the importance of social capital in accelerating knowledge transfer and digital innovation in villages. Furthermore, the role of village governments as facilitators of digital training also emerged as key. Still, training was found to be

generally incidental, with limited coverage and not yet institutionalized within the village development agenda (Doloi, 2025). Thus, digital literacy in villages requires a collaborative intervention model involving families, communities, the government, and external actors, as well as the strengthening of continuous training programs.

In this sense, CDEM enriches SVF by emphasizing micro-social mechanisms of knowledge diffusion that institutional models often overlook. While SVF focuses on infrastructure and governance integration, CDEM reveals the relational dimension of digital adoption—trust, kinship, and peer learning—as key enablers of sustainability. The Bone case illustrates how strong family-based learning compensates for weak institutional scaffolding, demonstrating that social capital serves both as a substitute for and a catalyst for formal digital infrastructure.

The village digitization strategy in Desa Data, as described in Sub-Theme 2.2, is still generally limited to the use of village websites for information and promotional functions and has not yet reached the stage of optimal integration of digital economic transactions. BUMDes, which, in the literature, are expected to become the driving force of the village digital economy (Kementerian Desa PDTT, 2023), in practice, only function as providers of savings and loans or as manual administrators (Lomnitz & Sheinbaum, 2004). This finding aligns with institutional readiness theory (Labrecque et al., 2013), which suggests that digital transformation will only be effective when technological capacity is matched with organizational adaptation and leadership commitment. In Bone, institutional inertia and limited budgetary autonomy prevent BUMDes from adopting e-commerce systems or integrating fintech.

The low utilization of village websites for e-commerce or digital payment systems is also consistent with BPS (2022), which found that the majority of village websites in Indonesia are used solely as information boards, not as economic transaction platforms. Furthermore, this study reveals several major obstacles to implementing the village digital economy (Theme 3), including infrastructure constraints, limited internet connectivity, limited literacy, and community participation and discipline. These barriers reaffirm the centrality of the Digital Readiness Index—a key indicator in Indonesia's Desa Cerdas framework under Kemendes PDTT. The Bone case exemplifies villages in the “emerging” category, where digital potential exists but requires sustained policy, infrastructure, and training to achieve maturity.

Almost all informants complained about network issues, indicating that the digital infrastructure in villages is still inadequate. These infrastructure issues align with the findings of Aminah & Saksono (2021) and Saputra et al. (2023), which emphasize that the digital divide remains a significant challenge in Indonesian villages. In addition to connectivity, limited village budgets and BUMDes funds for investing in equipment and training are also major barriers.

Regarding digital literacy, this study reveals significant challenges: although many business actors are already utilizing social media, their understanding of applications, digital transactions, and cybersecurity remains limited. This aligns with the findings of Cāne (2021) and Kosasih & Sulaiman (2024), who noted that the success of village digitalization is highly influenced by community literacy and access to ongoing training. Without widespread digital literacy, technology will be enjoyed only by those already “digitally literate,” while the majority of residents remain passive spectators.

Community participation and discipline are also important issues that have emerged. Many informants believe that active individuals drive digitalization programs, while the general public remains passive. This phenomenon aligns with the research by Saputra et al. (2023), which states that collective behavioral changes in villages typically occur after there are tangible examples of success from individuals or pioneer groups. Discipline in training and payments is also a problem, indicating that strengthening motivation and providing incentives are important strategies to increase community participation in village digitalization programs (Ilham et al., 2023).

Theme 4 highlights the hopes and initiatives of various village actors to strengthen the digital ecosystem going forward. Various informants hope that digital training is not only provided to village officials but also targets business actors and the general public. The main narratives are expectations for the availability of public Wi-Fi, improved network quality, and the development of village websites to support the promotion and marketing of products outside the region. These expectations reinforce the literature emphasizing the importance of multi-actor collaboration in building smart villages (Komorowski & Stanny, 2020; Patnaik et al., 2020).

Beyond local aspirations, these findings have significant policy implications. The experience of Data Village demonstrates how Desa Cerdas can be scaled up through three key mechanisms:

- 1) Replication through adaptive design – other villages can adopt the same social media-driven model, adjusting to their economic base.
- 2) Integration with BUMDes digital platforms – transforming village-owned enterprises into digital service hubs.
- 3) Policy embedding – incorporating digital literacy and infrastructure targets into village development plans (RPJMDes).
- 4) These mechanisms illustrate the scalability of Bone’s model as a prototype for community-led smart-village implementation within Indonesia’s broader rural digitalization agenda.

Theoretically, this study confirms the relevance of the Smart Village Framework (Komorowski & Stanny, 2020; Patnaik et al., 2020), which highlights the synergy of technology, institutions, literacy, and community collaboration as drivers

of digital transformation in rural areas. However, an implementation gap remains between policy design and on-the-ground reality, particularly regarding infrastructure readiness and local institutional capacity—a gap also noted by Câne (2021) and ENRD (2018).

By proposing the integrated SVF–CDEM model, this study offers a new theoretical contribution: a contextualized hybrid framework that operationalizes smart village transformation in resource-constrained settings. Unlike the original SVF, which is policy-driven, or CDEM, which is socially grounded, this hybrid model explains how bottom-up innovation and top-down governance must coevolve to create sustainable digital villages.

In practice, village governments need comprehensive, realistic digitalization roadmaps—from infrastructure development and public Wi-Fi provision to embedding digital training into community empowerment programs. Village-owned enterprises should be encouraged to develop digital business units and user-friendly transaction platforms. Partnerships with the private sector, universities, and IT communities can accelerate technology adoption, while showcasing successful digital entrepreneurs can inspire broader participation. Village officials must also be empowered as digital champions through continuous training and incentives.

At the policy level, these findings align with the Desa Cerdas strategy under Kemendes PDTT, emphasizing that digital transformation requires multi-level governance—national frameworks, district facilitation, and community initiative synergy. For replication, the Bone model can serve as a scalable blueprint for rural innovation hubs integrating training, mentorship, and digital infrastructure provisioning. In conclusion, this discussion extends beyond confirming previous literature: it challenges the assumption that digital readiness must precede community participation. Instead, this study shows that community agency can drive digital transformation even amid institutional constraints, positioning local innovation as the cornerstone of Indonesia’s inclusive smart-village development.

Conclusion

This study demonstrates that digital transformation through the Smart Village initiative in Desa Data, Mare District, Bone Regency, has reshaped how rural communities engage with digital technology. Social media has become the primary driver of economic connectivity—enabling local MSMEs to expand markets, enhance customer interaction, and build confidence in digital entrepreneurship. However, the digital transformation remains partial, centered on promotion rather than full e-commerce integration, due to limited institutional readiness, infrastructure, and literacy. This condition highlights the local manifestation of the research gap identified earlier—where technological innovation outpaces institutional adaptation. The integration of the Smart Village Framework (SVF) and the Community-Based Digital Economy Model (CDEM) offers a new analytical

synthesis, explaining that sustainable digital transformation in villages emerges from the interplay between infrastructure, institutional capacity, social capital, and digital literacy.

This research contributes practically to Indonesia's Desa Cerdas policy framework by proposing a localized roadmap for strengthening the digital ecosystem. The findings underscore the need for multi-actor collaboration among the government, BUMDes, communities, and the private sector to ensure inclusive digital participation. For policymakers, the case of Data Village illustrates that community-driven digital initiatives can complement top-down infrastructure programs, accelerating the diffusion of digital literacy and innovation in rural settings. Institutionalizing digital training, expanding public Wi-Fi, and transforming BUMDes into digital service hubs are essential steps toward realizing an integrated, community-based digital economy. At the national level, the study reinforces the need for village digitalization policies to prioritize infrastructure and cultivate human and institutional readiness, ensuring equitable participation across regions.

This study is limited by its single-case design and reliance on qualitative narratives, which may constrain generalizability. Future studies should employ comparative multi-village designs or mixed methods to evaluate how different governance, geography, and social contexts influence smart village implementation. Longitudinal research is also recommended to assess the sustainability of digital transformation outcomes over time. Further inquiry should examine the roles of youth, gender inclusion, and local innovation ecosystems in scaling up smart village models across Indonesia. Such studies would enrich both the theoretical discourse on rural digital transformation and the practical development of adaptive, evidence-based policies for inclusive digital villages.

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