

Transforming Rural Development with Village-Centered Digital Innovation

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Abstract. Digital transformation has created new opportunities for rural development but also presents significant challenges, such as the digital divide that exacerbates disparities in access to and use of technology. To address these challenges, the Banyuwangi Regency Government has implemented the Smart Kampung program, a strategic initiative to ensure inclusivity in digital transformation at the village level. This program is designed to accelerate development and improve the quality of public services in rural areas. This research examines the strategic implementation of the Smart Kampung program with a focus on Sukojadi Village, a village that has successfully adopted digital innovation. The study uses a qualitative approach to explore the processes and challenges of Sukojadi Village in its journey toward digital transformation. The findings reveal key factors that contribute to the success of Village-Centered Digital Innovation and provide practical insights for other regions aiming to bridge the digital divide and drive inclusive rural development. This study offers a replicable model for fostering sustainable and inclusive digital innovation in rural settings.

Keywords: Digital Divide; Smart Village; Digital Transformation

1 Introduction

Digital transformation has become a critical priority in government operations worldwide, marking a significant shift in the delivery of public services [1], [2]. It is widely recognized as a strategic tool to enhance efficiency, transparency, and inclusivity in governance [3]. The digital era has revolutionized societal operations and how governments interact with citizens, yet its benefits are not equally distributed. This disparity, known as the digital divide, highlights the unequal access to and utilization of digital technologies, particularly in rural and remote areas where inadequate infrastructure, low digital literacy, and economic challenges create significant barriers to technology adoption [4], [5], [6]. In Indonesia, this divide remains a pressing issue, with rural areas lagging behind urban regions in technological development, limiting access to essential services such as healthcare, education, and administrative processes [7], [8], [9]. Addressing these challenges requires a comprehensive strategy integrating infrastructure development and capacity-building to ensure equitable access to digital tools and services.

In response, the Banyuwangi Regency Government in East Java launched the Smart Kampung program, an innovative initiative leveraging information and communication technology (ICT) to address rural development challenges [10]. The program aims to improve public service delivery, empower communities, and stimulate local economic growth. By

combining infrastructure development, such as internet connectivity and administrative tools, with community-based digital literacy training, the program aligns top-down government policies with the specific needs of local communities, representing a scalable and adaptive model for digital governance [11]. The Smart Kampung program has three primary objectives: enhancing access to public services, promoting transparent governance, and fostering community-driven digital literacy.

Sukojati Village in Banyuwangi Regency exemplifies the successful implementation of the Smart Kampung program. The village has embraced digital innovations such as electronic systems for population administration and access to health and education services, significantly improving the efficiency of public service delivery [12]. These innovations have also strengthened trust between the local government and the community, demonstrating the transformative potential of digital technology in addressing local challenges and fostering sustainable rural development. While previous research has documented the success of the Smart Kampung program in improving public services and community empowerment, limited studies have explored the local adaptation processes and their broader impact on rural areas. The literature identifies key challenges such as inadequate infrastructure, low digital literacy, and insufficient policy support. However, the potential for leveraging local resources and community-driven innovation offers opportunities for further study.

This research focuses on Sukojati Village as a case study to examine the implementation of the Smart Kampung program, with particular attention to the processes, challenges, and success factors of village-centered digital innovation. This research aims to provide insights into how digital innovation can address local needs, empower rural communities, and serve as a replicable model for other regions facing similar challenges. The findings are expected to contribute to the growing knowledge of foliage-level digital transformation and inform policy and practice in rural development.

2 Methods

This study adopts a qualitative approach to explore the phenomenon in-depth. This methodology is particularly suited for examining the local context and dynamics involved in implementing village-centered digital innovation, which encompasses complex interactions among policy, technology, and society. The research design is exploratory, aiming to elucidate the processes underlying village-centered digital innovation as demonstrated through the Smart Kampung program. Additionally, this study seeks to identify the key success factors that contribute to the effective implementation of digital innovations. The research focuses on Sukojati Village, recognized as a model for successfully implementing the Smart Kampung program, and gathers detailed contextual data on its implementation.

Research informants were selected purposively to ensure the collection of relevant and in-depth data. The informants include: 1) Banyuwangi Regency Communication, Informatics, and Cryptography Service: Providing technical and operational data for implementing the village digitalization program. 2) Sukojati Village Apparatus: Providing local perspectives on implementing Smart Kampung at the village level, the challenges faced, and its impact on the community. The study integrates data from two primary sources: 1) Primary Data Collected through in-depth interviews with key informants and direct field observations to capture real-time and nuanced insights. 2) Secondary Data: Derived from policy documents, program implementation reports, publications related to Smart Kampung, and relevant statistical data.

This combination of primary and secondary data is designed to provide a comprehensive understanding of the phenomenon, allowing for a thorough analysis of the context, implementation processes, and outcomes of the Smart Kampung program in Sukojadi Village. The approach ensures the findings are empirically grounded and contextually rich, contributing to the broader discourse on rural digital transformation.

3 Result and Discussion

Indonesia has established a policy framework for digital government through the Electronic Government System policy. This initiative represents a strategic effort by the government to drive digital transformation within public administration and to enhance efficiency, transparency, and accountability in public service delivery. In this study, the Electronic Government System policy serves as a critical contextual framework that shapes the implementation of digital initiatives, including village-level programs such as Smart Kampung. The policy acts as a national guideline to ensure that digital transformation is not limited to the central government but is uniformly adopted across all levels of governance, including regional and local governments. This policy reflects a structured, top-down approach that promotes technology integration into governance practices.

Banyuwangi Regency has emerged as a leading example of effective implementation of the Electronic Government System policy at the regional level. The regency's proactive adoption of digital governance principles is evidenced by its achievement of the highest Electronic Government System Index among local governments in Indonesia. This accomplishment highlights Banyuwangi's capacity to align national digital transformation policies with local needs, serving as a benchmark for other regions in leveraging the Electronic Government System framework to advance governance and public service delivery.

Table 1. Achievements of the Banyuwangi Regency Government related to the Electronic Government System Year 2018-2023

Year	2018	2019	2020	2021	2022	2023
Banyuwangi Regency	3.43	3.22	3.22	3.53	3.53	4.50

Source: Ministry of State Apparatus Empowerment and Bureaucratic Reform of the Republic of Indonesia, 2023

The Electronic Government System mandates the implementation of electronic governance across all government agencies at both central and regional levels. This directive aims to encourage optimal utilization of technology to enhance the efficiency, transparency, and accountability of public service delivery. In the context of this study, implementing the Electronic Government System at the village level through the Smart Kampung program in Banyuwangi Regency serves as a concrete example of how national policy requirements translated into localized governance practices. To ensure consistent and measurable progress, the Banyuwangi Regency Government annually evaluates all villages, issuing the Electronic Government System Index at the village level as a performance metric. This evaluation framework not only tracks the adoption of technology at the village level but also reinforces the alignment of local initiatives with broader national digital transformation objectives.

A. Smart Kampung Innovative Program

The Smart Kampung initiative represents an innovative adaptation of the Smart City concept, tailored specifically to the rural context by the Banyuwangi Regency government. While the Smart City model focuses on enhancing the quality of life in urban communities by integrating information and communication technology (ICT), the Smart Kampung program addresses rural areas' unique needs and challenges. Its primary objective is to foster holistic rural development and community empowerment by leveraging digital technology as a transformative catalyst for change. This approach underscores the importance of aligning technological innovations with local contexts to maximize their impact on rural development.

The Smart Kampung initiative in Banyuwangi Regency is built upon seven key dimensions, which are the foundation for its comprehensive approach to village-based digital transformation[14]

1. IT-Based Public Service: This dimension focuses on integrating information technology into public service delivery, enabling villages to offer more efficient, transparent, and accessible administrative services. Digitizing processes such as population administration and service requests significantly reduces bureaucracy and improves service quality.
2. Education and Culture: This dimension recognizes the importance of education and cultural preservation. It leverages digital platforms to enhance access to educational resources and promote cultural heritage.
3. Health: In the health sector, Smart Kampung employs digital tools to improve healthcare accessibility and quality. Initiatives such as health education campaigns delivered through digital channels ensure that even remote villages can access essential healthcare services.
4. Economic Empowerment of People: This dimension aims to strengthen local economies by providing digital platforms for micro, small, and medium enterprises (MSMEs) to market their products and services. It also facilitates access to financial services and entrepreneurial training, empowering communities to enhance their economic resilience and productivity.
5. Poverty Reduction: The program incorporates targeted measures to address poverty through digital inclusion and access to government assistance programs. By improving data management and streamlining welfare distribution, the program ensures that support reaches the intended beneficiaries efficiently.
6. Public Information Disclosure: Transparency is a critical component of good governance, and this dimension emphasizes the use of digital tools to promote public access to government information. Websites, social media platforms, and other online channels disseminate information on government activities, policies, and budgets, fostering community trust and engagement.
7. Governance: The governance dimension focuses on enhancing the capacity of village administrations through digital technology, including implementing e-governance systems for decision-making, resource management, and community engagement, ensuring that governance processes are more accountable and effective.

Smart Kampung transforms traditional villages into smart, modern, and independent villages through technology. This concept not only answers basic problems in the village but also creates new opportunities that can significantly improve the quality of life of village communities.

B. Village Electronic Government System and Smart Kampung in Sukojadi Village

Sukojadi Village is a successful example of implementing the Smart Kampung program. The village has not only integrated digital technology into its governance processes but has also received numerous awards for its digital innovations. Sukojadi achieved a high ranking in the 2023 Village Electronic Government System Index, reflecting its success in leveraging information technology to deliver public services efficiently and inclusively. Sukojadi Village offers online access to various village services through the Smart Kampung application. Residents can submit administrative requests for documents such as identity cards and family cards and access health and education services without physically visiting the village office. This inclusive approach allows residents outside the village to access these services via digital platforms. Such innovations demonstrate how technology can overcome geographical barriers and enhance community convenience in accessing essential services.

The success of the Smart Kampung program in Sukojadi Village is closely tied to the active support of the Banyuwangi Regency Government, which conducts bi-weekly evaluations to identify challenges and provide strategic recommendations for improvement. This proactive approach ensures that the program remains effective, adaptive, and aligned with the community's evolving needs. In addition to implementing the Smart Kampung program, Sukojadi Village has independently developed innovative digital solutions. A prominent example is creating a digital archive application and a barcode-based identity card system, which enables efficient administrative data management and enhances service transparency. While this innovation operates independently of the broader Smart Kampung framework, it significantly strengthens the village's digital ecosystem and highlights Sukojadi's capacity for technological self-reliance.

Despite these achievements, the village faces challenges in fostering community support for digitalization, with adoption rates currently at approximately 40%. Many residents lack a full understanding of the benefits of digital services, necessitating more intensive and innovative outreach efforts. To address this, Sukojadi Village has implemented the "Kepaling" program, a mobile service initiative that delivers digital services directly to residents. This program not only facilitates access for those unfamiliar with technology but also effectively enhances digital literacy within the community. By combining innovative solutions with targeted outreach, Sukojadi Village continues to advance its digital transformation while addressing key challenges.

C. Key Success Factors

The successful implementation of the Smart Kampung program in Sukojadi Village is attributed to several critical factors that serve as the foundation for its digital transformation. These factors include:

1. Commitment of the Village Work Team

The Smart Kampung program's success in Sukojadi Village largely depends on the unwavering commitment of its village work team. This commitment is rooted in the core values of coordination, Communication, and cooperation (3C), which guide the village apparatus in ensuring the seamless execution of the program. Inclusive and effective leadership by the village head plays a pivotal role in fostering team involvement by promoting collaboration and shared responsibility. By creating a work environment where all team members feel accountable for the program's success, the village head ensures that responsibilities are not confined to rigid boundaries, allowing for greater flexibility and innovation. Moreover, the commitment of the village work team is reinforced by the active support and oversight of the Banyuwangi Regent and

related agencies. This consistent encouragement ensures that the Smart Kampung program receives the attention and prioritization it deserves. As a result, the village work team remains motivated to pursue continuous innovation and improvements in delivering services to the community.

2. Local Needs-Based Innovation

A distinguishing feature of Sukojadi Village's digitalization efforts is its focus on addressing the specific needs of the local community. Innovations under the Smart Kampung program are developed based on thorough analyses of local challenges and requirements. For instance, introducing digital archives has significantly streamlined administrative services, providing residents faster and more efficient access to essential documents. This needs-based approach underscores that digital transformation is not solely about adopting technology but also about adapting it to meet the practical needs of the community. This alignment between technological advancements and community-specific challenges ensures the program's relevance and enhances its positive impact on residents' daily lives.

3. Transparency and Accountability

Transparency and accountability are foundational pillars of the Smart Kampung program in Sukojadi Village. Information regarding village planning, finances, and public services is accessible to the community through the village website and social media platforms. This open approach enables residents to monitor village government activities in real time, fostering trust and confidence in local governance. Transparency also cultivates a culture of accountability, where every program and expenditure is documented and justified. This open approach strengthens the village administration's integrity and encourages active community participation in monitoring and evaluating the program. The program enhances community engagement by involving residents in oversight processes and ensures sustainability.

D. Impacts and Challenges

Implementing the Smart Kampung program in Sukojadi Village, Banyuwangi Regency, has positively impacted the community across various dimensions. These impacts are outlined as follows:

1. Increased Efficiency

The Smart Kampung program has significantly enhanced the efficiency of administrative processes within the village government. By leveraging digital applications, administrative services such as issuing identity cards, family cards, and birth certificates are processed more quickly and conveniently, with minimal reliance on physical documents. The digitization of services improves the operational efficiency of village apparatus and aligns with environmentally friendly practices by reducing paper usage. This dual benefit provides greater convenience for community members managing their administrative needs, saving time and effort while enabling the village government to deliver more responsive and effective public services.

2. Economic Empowerment

The program has also made substantial contributions to the economic empowerment of the village community by integrating digital technology into local economic activities. Sukojadi Village collaborates with Village-Owned Enterprises and Micro, Small, and Medium Enterprises (MSMEs) to utilize digital platforms to promote and market local products. This initiative demonstrates the potential of technology as a

catalyst for local economic growth, improving income opportunities and overall community welfare.

3. Community Capacity Building

Beyond technological implementation, the Smart Kampung program significantly emphasizes community capacity building. The village government organizes regular socialization and training sessions to improve residents' digital literacy. These training programs cover areas such as using village applications, leveraging the internet for business development, and accessing online public services. The goal is to ensure that all community members, including those previously unfamiliar with technology, can actively participate in and benefit from the village's digital transformation.

While the Smart Kampung program in Sukojadi Village has achieved notable success, its implementation is not without challenges. Addressing these challenges ensures the program's long-term sustainability and effectiveness. Three primary challenges are outlined below:

1. Technology Adoption

A significant challenge lies in the adoption of technology by village residents. Certain demographics, particularly the elderly, resist digitalization due to low digital literacy, discomfort with technological devices, or entrenched traditional habits. Furthermore, varying levels of understanding regarding the benefits of technology hinder widespread acceptance.

2. System Integration

Another critical challenge is the lack of seamless integration between village-level digital applications and the district-wide Smart Kampung system. Some village-developed applications operate independently and are not fully connected to the district's digital infrastructure, leading to inefficiencies and inconsistencies in service delivery. This issue often stems from disparities in technological standards, operational policies, or insufficient Communication and coordination between village and district governments. Addressing these gaps requires improved collaboration, standardization, and alignment of systems to enhance the overall effectiveness of digital governance.

3. Technical Constraints

Technical constraints pose another challenge to effectively implementing digital services, although their occurrence is relatively infrequent. A stable and reliable internet network is critical for the optimal functioning of digital services. However, network disruptions, such as slow connectivity or disconnections, can significantly hinder service, particularly in rural areas where telecommunications infrastructure is still under development. Furthermore, the lack of fully optimized technological infrastructure can impede the sustainability and efficiency of digital services. Addressing these technical limitations requires strategic investment in infrastructure development, regular system upgrades, and the provision of technical support to ensure seamless and uninterrupted service delivery.

Based on a comprehensive analysis of the process, keys to success, and challenges faced by Sukojadi Village in implementing the Smart Kampung program, this study proposes a conceptual model that can support the success of digital innovation at the village level.

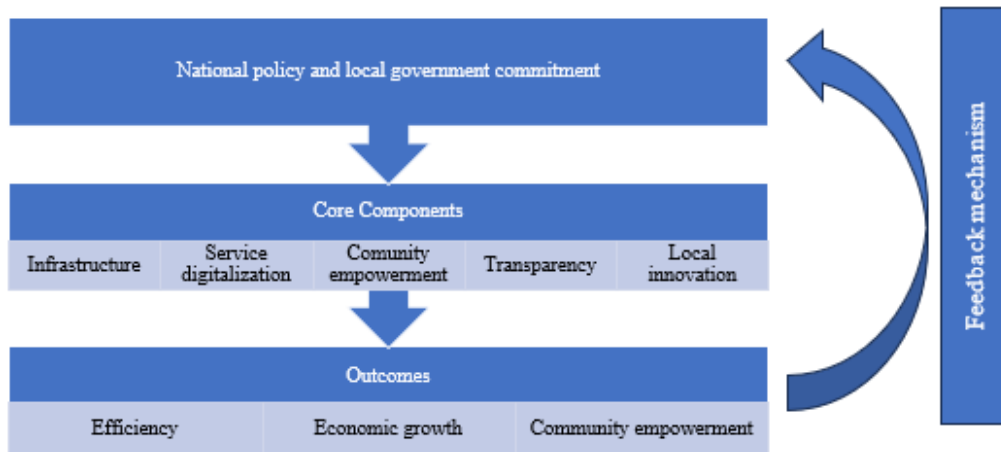


Fig. 1. Purposed Village-Centered Digital Innovation Framework

This model emphasizes the importance of national policies that are in line with local government commitments as the primary foundation for driving digital transformation in rural areas. In addition, this model identifies core components that the village must own, including adequate technological infrastructure, digitalization of public services, community empowerment through increased digital literacy, transparency in governance, and local innovation based on community needs. The integration of these components is expected to produce various positive impacts, such as increased efficiency of public services, locally-based economic growth, and improved quality of life for village communities.

Furthermore, this model also emphasizes the importance of a continuous feedback mechanism to ensure the program's relevance to community needs and support the sustainability of digital initiatives in the long term. This approach is expected to be a strategic reference for other villages that want to adopt inclusive digital transformation.

4 Conclusion

This study highlights how Sukojadi Village in Banyuwangi Regency has effectively utilized the Smart Kampung program to lead digital transformation at the village level. We can summarize into three key conclusions: First, Sukojadi Village demonstrates that villages can serve as active drivers of digital government, rather than merely passive recipients of top-down policies. Through the Smart Kampung program, the village has successfully developed digital services tailored to the needs of its local community, including technology-based administrative, educational, and healthcare services. This success highlights the synergy between a bottom-up approach—where villages innovate based on local needs—and a top-down approach, such as the implementation of the Electronic Government System policy. The effective collaboration between these approaches underscores the importance of multi-level government cooperation in fostering inclusive and sustainable digital transformation.

Second, the digital transformation in Sukojadi Village underscores the critical role of a community-based approach in creating responsive and inclusive governance. The program has significantly enhanced community participation and trust in village governance by actively

engaging the community through training, outreach, and the development of locally relevant digital services. This approach ensures that digital transformation goes beyond improving service efficiency; it also strengthens the relationship between the government and the community through openness, transparency, and accountability principles. Such practices illustrate how placing the community at the transformation centre can lead to more meaningful and sustainable outcomes.

Third, The success of Sukojadi Village demonstrates the potential of the smart village concept as an effective strategy for promoting digitalization in rural areas. This concept extends beyond technology adoption to emphasize community-centric development, addressing challenges such as limited access to services and low digital literacy with tailored and sustainable solutions. The achievements of Sukojadi Village illustrate the replicability of the smart village model, offering a blueprint for other rural areas aiming to pursue digital transformation. By focusing on community empowerment and improving the quality of life, the smart village concept emerges as a pivotal framework for rural development in the digital era.

To comprehensively understand the long-term impact of the Smart Kampung program, further in-depth research is essential. Future research should particularly focus on the following key areas: 1) Local Economic Impact: Investigating how digitalization under the Smart Kampung program influences local economic growth. This research includes assessing its impact on micro, small, and medium enterprises (MSMEs), such as increased market access, productivity, and new economic opportunities within the community. 2) Program Sustainability: Identifying the factors that contribute to the sustainability of the Smart Kampung program. This research includes examining technical aspects, such as infrastructure maintenance and technological upgrades; financial aspects, such as funding mechanisms and cost-effectiveness; and social aspects, such as community acceptance, engagement, and long-term participation. These areas of research will provide valuable insights into the effectiveness and replicability of the Smart Kampung program, ensuring its relevance and adaptability in supporting rural digital transformation over the long term.

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