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Digitalization Initiatives In Rural Areas: An Empirical Analysis From West Java, Indonesia

Nicolaus Petrus Likuwatan Werang[1], Maria Lusiana Florentin Werang[2], Priscilia Yolandasari [3], Yeni Husnaeni[4], Mia Rizki[5]
[1,3,4]The Indonesian Scientist Association of Public Administration (AsIAN), Jakarta, Indonesia
[2]Department of Public Administration, Faculty of Social and Political Science, Parahyangan Catholic University, Bandung, Indonesia
[5]Department of Public Administration, Faculty of Social and Political Science, Diponegoro University, Semarang, Indonesia

Email: nicolauspetrus@gmail.com

Abstract

Digital initiatives have great potential to enhance the quality of life in rural communities. However, for the benefits to be evenly distributed, this process must be inclusive. The West Java government has taken crucial steps through the "Rural Digitalization" program and supporting regulations in 2022. Moreover, barriers such as uneven internet infrastructure, low digital literacy, and minimal use of technology in key sectors such as agriculture, fisheries, and livestock are still major barriers. Coupled with weak coordination between levels of government and budget constraints, it also slows down realisation in the field. This study aims to identify gaps in the initiative of rural digitalisation and offer practical solutions. Through a descriptive qualitative approach and literature study, it was found that access to technology needs to be balanced with locally relevant skills, confidence, and innovation. This study offers a roadmap in the form of mobile-based digital training, a community internet model, and affordable technology solutions. Then, the success of digital initiatives in rural areas depends on long-term collaboration between the government, private sector, and community.

Keywords: Rural Digitalisation, Rural Governance, Innovation.

INTRODUCTION

The dichotomy between urban and rural development for digitalisation has become a complexity that has not been resolved proportionally in Indonesia (Hadi, 2018; Keban, 2019; Vujanovic, 2017); this is based on several indications (e.g. overlapping regulations, disproportionate governance, non-specific roadmaps, and weak institutional capacity). Then, starting from this problem, if traced to the local area, especially West Java Province Indonesia, has experienced something quite concerning because this area has a dominant Indonesian population living in this area (Central Bureau of Statistics, 2024). Nevertheless, there is a special urgency, and although this area has significant economic growth potential,

there is a disparity pertinent to the internet enactment gap that is still clearly visible, especially in rural areas. Here is the data:

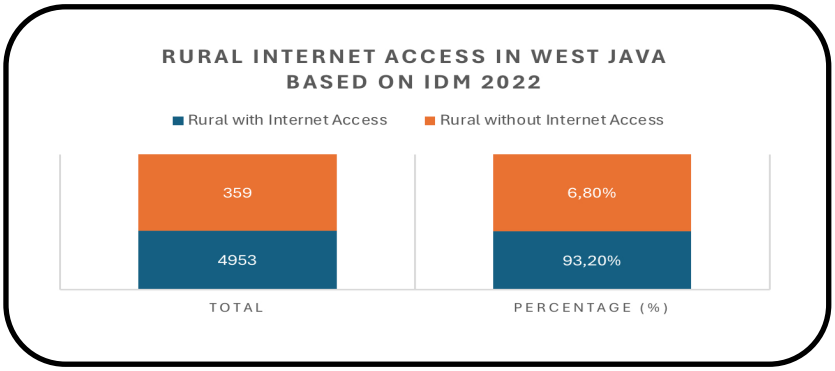

Figure 1. Rural Internet Access, West Java

Source: Processed Secondary Data, 2025

The digital initiative in West Java isn't about infrastructure systems. But, it needs more commitment to actualize. In our investigations, the gap deeply influences policies between the central government and local authorities. While national goals for digital transformation are set, the reality on the ground often differs because regional governments face unique barriers (e.g., limited resources, differing priorities, or a lack of alignment with national strategies). This mismatch has led to uneven digital access, notably in rural areas, where local governments may not have the enhancement or flexibility to actualize broad-reaching digital initiatives.

The data above shows that 93.20% of rural areas in West Java are now connected to the internet, reflecting significant progress in providing digital infrastructure for these communities. This connectivity is not just a number but a transformation that allows most rural areas to access information, communicate, and participate in technology-based activities. With wider internet access, residents in rural areas now have the chance to revamp their quality of life, develop businesses, and take advantage of more open opportunities in education. Hence, this connectivity also has a direct impact on increasing the efficiency of public services, where the government can more easily deliver information and services to the wider community. As stated by Zulmasyhur (2024), expanding connectivity is not just about connecting devices; it is also part of an effort to realize better digital governance, which in turn will change the way public services are delivered and accelerate the process of transforming these services (Zulmasyhur et al., 2024). In contrast, 6.80% of rural areas still lack adequate internet access, which means this is where the policy disconnect becomes most evident. While some areas are thriving, others are still not getting access properly, further deepening regional inequalities.

Thus, these restrictions prevent a small portion of the rural population from accessing the various benefits offered by Internet adoption (e.g. e-commerce, online education, or vital information linked to

health and government). So this is sustained by Y. Zhang (2022), who explained that rural that are still lagging in terms of internet access are at risk of being left behind in social and economic progress (Zhang et al., 2021). Moving on to Hjort (2021) also describes this correlation. His findings affirm that internet connectivity has the potential to affect economic growth significantly. Still, the effects vary widely depending on the context, outcomes, and specific forms of internet usage studied (Hjort & Tian, 2025). While there are clear positive impacts in many cases, such as enhancing business operations, improving access to information, and boosting productivity, not all regions or sectors experience the same benefits. It suggests that while internet connectivity can foster economic development, deeply rooted barriers to infrastructure restriction, education, and local governance must be forward for these benefits to be fully realised.

A similar view is also outlined by Clark (2022), who explores the impact of digital technologies in achieving the 17 Sustainable Development Goals (SDGs), especially in the face of similar challenges in their governance (Clark et al., 2022). It argues that digital inclusion and connectivity are critical to advancing all SDGs, as they enable access to education, social participation, and economic activity, especially during crises. Thus, based on the Fair Digital Ethics Framework, he proposes a new SDG 18 called "Digital Connections", which focuses on the equitable distribution of digital resources. Finally, it emphasises that four key drivers (e.g. digital capabilities, technology, infrastructure, and governance) are critical to achieving all SDGs through strategic policies and planning. To sum up, by reflecting on the existing problems, this study's purpose is to investigate, comprehend, and analyse the practices of digitalisation initiatives that have been initiated and formulate practical strategies. These findings also supply information for policymakers to be more concerned in responding to the problems faced.

LITERATURE REVIEW

As we approach the complex topic of digitalization in rural areas, we are drawn to the intersection of technology and community development. Rural communities worldwide stand at a critical technological crossroads. It reflects deeper socioeconomic inequalities. The existing literature reveals several key themes worth focusing on. For instance, infrastructure development remains fundamentally uneven (Akifieva et al., 2021; Baetova et al., 2022). While urban centers enjoy increasingly sophisticated digital ecosystems, rural communities frequently contend with limited connectivity options, unreliable service, and outdated technologies (Bi, 2024). As (Sovetova, 2021) might note, this uneven development isn't merely coincidental but illustrates systematic patterns of investment prioritization. Yet, these promises remain unrealized in communities lacking robust digital infrastructure. The literature suggests variations in how rural populations perceive technological change. Some communities eagerly embrace

digital tools as pathways to economic diversification and growth, while others express concern about threats to traditional practices and community cohesion.

Based on this, there is a need for policy approaches to rural digitalization, which have evolved significantly over time. This shift reflects a growing recognition that meaningful participation in modern economic and social life requires digital literacy and access (Babeshin et al., 2021; Di Stefano et al., 2025). In addition, the correlation linked to the economic implications of rural digitalization generates considerable scholarly debate. Some researchers emphasize potential benefits: e-commerce platforms enabling small businesses to reach global markets, digital skills creating new employment pathways, and remote work opportunities allowing residents to remain in rural communities while accessing urban job markets (Klimenko et al., 2023; Mityakov et al., 2020; Sodano, 2021). Others caution that these benefits often flow unevenly, potentially widening inequality between digitally connected and disconnected populations. As we reflect on this body of literature, we are reminded that digitalization isn't merely a technical process but a deeply progressing one. Its success depends not just on infrastructure deployment but also on how technologies align with community needs, values, and aspirations. It begins by managing rural needs rather than imposing external solutions.

Thus, we quote the development administration theory (Coccia, 2022), which states the role of local governments is primary in this process. It indicates local authorities are in the best position to recognize the unique needs and aspirations of their communities and must play a central role in shaping or concrete digitalization policies. Rather than relying solely on top-down, one-size-fits-all solutions, policies must empower local governance structures to tailor digital initiatives that resonate with rural populations. It means fostering digital skills in ways that are contextually appropriate, developing infrastructure in areas where it will have the greatest local impact, and ensuring that digital technologies serve to enhance, not disrupt, traditional ways of life and local economies. As a reminder, an integrated policy approach is required that combines the deployment of digital infrastructure with a deep comprehension of local needs, values, and aspirations. This approach calls for inclusive, community-led governance that permits rural populations to create their digital futures in ways that foster both social and economic inclusion.

In short, the path toward digital inclusion in rural areas is essential. By bringing together insights from technology studies, rural sociology, development economics, and community psychology, we can develop more integrated approaches that address both the technical and social dimensions of this transition. The literature makes clear that rural communities don't need to be passive recipients of technological change. They can be active shapers of digital futures that preserve what they value while embracing new possibilities.

RESEARCH METHOD

In this study, we adopt a qualitative descriptive approach with a literature study methodology to investigate, recognize, and analyze the practice of digitalization initiatives in the rural area of West Java Province, Indonesia. In this regard, we refer to Creswell's opinion (2016), which explains that qualitative descriptive research with a literature study approach can promote an intensive comprehension of the object being traced associated with an event in the daily context of the observed event so that this approach is very adaptive to help researchers to explore the context being studied (Creswell & Poth, 2016).

Next, the data analysis process is carried out systematically by collecting and analysing secondary data from various sources, calculating government reports in the form of policy documents, and using statistical databases and scientific journals. The application of this systematics can increase the validity and describe the findings analysed. Quoting to this, we adopt the five stages of analysis according to Creswell, namely:

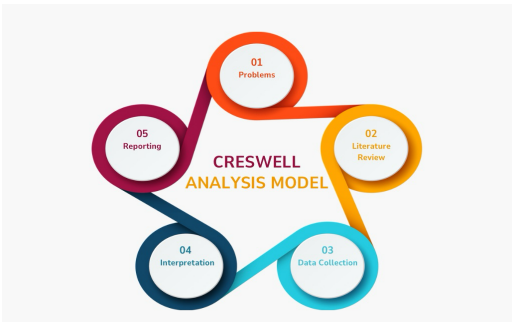

Figure 2. Creswell Analysis Model

Source: Author's Visualization

The first step in this process is to identify the problem, which refers to what isn't working in this digitalisation initiative and where the gaps are. Once the problem is clear, the next step is to examine existing research. Reviewing what others have found can provide a sense of what digital trends and strategies are working and what aren't. With this foundation in place, it's time to collect data. The goal is to understand how digital initiatives are being implemented in the field and what's going on with the progress. Once the data is collected, the next phase is to interpret it. It means carefully analysing the

results to uncover key insights into what makes digitalisation successful and where improvements need to be made.

Finally, the study concludes by reporting the findings in a clear and actionable way. The intention is not just to comprehend the barriers but also to suggest practical solutions and strategies that can assist the government in lifting digitalisation efforts in the future. This process ensures that the study doesn't just examine numbers or theories but actually provides real solutions to enhance the application of digitalisation initiatives.

RESULTS AND DISCUSSION

Practice of Digitalisation

Digitalisation has emerged as a key focus in global efforts to drive sustainable development and create inclusive economic growth. It also emphasises that the rapid advancement of digital technologies (e.g., the Internet of Things (IoT), artificial intelligence (AI), machine learning, robotics, and big data) has the potential to significantly transform economies, societies, cultures, and political systems around the world (ALEKSANDROVA et al., 2022; Singh & Bhim Jyoti, 2023). These technologies are transforming industries and presenting opportunities and barriers in many areas of life. As they develop, they have the power to transform the way businesses function, governments operate, and individuals engage in their communities.

However, West Java faces a unique challenge in adapting to these rapid changes, especially given the region's rural demographics and limited infrastructure. While urban populations have better access to digital resources and technology, rural communities in West Java are not yet fully benefiting from the advancements of the digital age. This digital gap is concerning because technology can improve rural communitie's quality of life by providing access to better healthcare, education, economic opportunities, and living standards. Addressing this disparity is vital to ensure no one is left behind in the digital transformation.

In response to these challenges, the Provincial Government of West Java has introduced the "Rural Digital" initiative to empower rural communities through inclusive digitalisation. The program's primary objective is to create self-sufficient rural by integrating digital technologies that lift the lives of rural populations. The Provincial Government issued West Java Governor Regulation No. 8 of 2022 to support this initiative, prioritising the Rural Digital program as a key activity for enhancing rural welfare.

This regulation also calls for creating a technical guideline for the program's initiatives, ensuring the program's structured and consistent application across the region. The Rural Digital initiative is designed to provide a complete framework for the digital transformation of rural areas. To ensure the program's long-term success, the Provincial Government developed the "Blueprint for West Java Rural

Digital". This blueprint serves as a roadmap for the program, outlining the key stages of development and implementation. It is divided into two sections: one explaining the concept of rural digital and another providing the specific strategies, operational processes, and monitoring systems required for successful implementation.

The concept of a rural digital in West Java revolves around four key stages: infrastructure development, digital literacy, digital marketing, and the adoption of digital technologies. These stages are essential for laying the foundation of a successful digital transformation that can empower rural communities. The first stage, infrastructure development, ensures that rural areas have reliable internet connectivity and telecommunication networks. Without the necessary infrastructure, the benefits of digital technologies cannot be fully realised. The second stage, digital literacy, is equally important. Rural populations must have the skills and knowledge to navigate and utilise digital tools effectively. By providing digital education and training, rural communities can access a wider range of services, including online healthcare, education, and government services. Digital literacy ensures that people in these areas are not excluded from the digital economy and can benefit from its opportunities. The third stage, digital marketing, focuses on helping rural businesses promote their products and services using online platforms. In rural communities, small businesses often face challenges in reaching larger markets.

By expanding their customer base and improving their competitiveness, these businesses can contribute to the local economy's growth. This stage also supports rural entrepreneurs, helping them explore new ways to market and sell their products. The final stage, applying advanced digital technologies, addresses integrating cutting-edge tools like IoT, AI, and big data into local industries and services. These technologies can optimise various sectors, such as agriculture, healthcare, and public services, to improve efficiency, productivity, and sustainability. By leveraging digital technologies, rural areas in West Java can tackle some of their most pressing challenges, including limited resources and insufficient infrastructure. The "Blueprint for West Java Rural Digital" also outlines four essential components for ensuring the program's successful implementation: strategy, execution, monitoring and evaluation, and collaboration. A clear and actionable strategy is essential to guide the program and ensure all stakeholders are aligned with their goals. The execution phase involves putting the plans into action, mobilising resources, and ensuring that the program is carried out effectively.

Based on the review, the rural digital initiative in West Java is an ambitious and paramount step to address the digital divide between urban and rural areas. By focusing on infrastructure development, increasing digital literacy, and utilising digital marketing and technology, the program aims to empower rural communities and drive inclusive economic growth. The main point regarding the practices initiated

will depend on effective planning, resource allocation, and strong stakeholder collaboration. It also needs to be observed through the context that it is not symbolic, but its actualisation can be accounted for.

Barries of Digitalisation

We have explored the existing barriers, and interestingly, this is proven by several major problems faced in the digitalisation process, including uneven internet network infrastructure, low digital literacy, and limitations in technological innovation in various sectors, such as agriculture, fisheries, and animal husbandry. For this reason, we describe these barriers by considering the core problems, existing evidence, the reasons behind the issues, and constructive criticism of existing literature (West Java Provincial Government, 2023) as follows:

- **Internet Network Infrastructure**

  One of the most fundamental barriers to digitalisation in West Java is the limited internet network infrastructure, especially in rural areas. Based on IDM data (2022), 359 rural in West Java are still categorised as "blank spots", namely rural that do not have adequate internet access. This barrier is exacerbated by differences in references and data calculations between the central, provincial, and district/sub-district, which makes efforts to develop internet infrastructure not effectively coordinated. In addition, the limited government budget for building towers in areas that are still underdeveloped is a serious obstacle to actualisation. So, this context strengthens the view of Valentín (2022), who explained that although there have been collaborative efforts between local governments to compile an integrated mapping of blank spot rural, the realisation of internet infrastructure development in these rural is still far from expectations (Valentín-Sívico et al., 2022).

- **Low Digital Literacy**

  In addition to infrastructure barriers, low digital literacy in the community is also a major obstacle to the actualisation of digitalisation. Here, it is highlighted that many people in West Java, especially in rural areas, still use the internet for unproductive purposes, such as accessing useless content. It is reflected in the complaint report issued by Saber Hoaks in 2021, where out of 1,774 monitored content, 1,116 of them were found to be hoaxes. These barriers show that although internet access is starting to increase, people do not fully recognise how to apply the internet for more positive and productive purposes, such as learning, business, or self-development. It connotes that through this phenomenon, there needs to be digital literacy education, which is the main factor causing the low public recognition of the benefits of the internet. Where, the Government and various related parties have collaborated with various parties to provide comprehensive training. If narrowed down, this kind of thing is also proven

by Suxiang Hu (2023), who justifies that although several training programs are running, their distribution is still very limited and more focused on younger people, while the elderly and people who are less exposed to technology are often neglected (Hu et al., 2023). Therefore, increasing digital literacy training for all levels of society, especially in rural, must be a priority so that digitalisation can run more inclusively.

- **Limitations of Digital Innovation in the Economic and Social Sectors**

  The last part is digitalisation in the economic and social sectors, which are still facing many barriers. One of the less developed sectors is the use of digital technology in agriculture, fisheries, and animal husbandry, which are the main sectors for most rural communities. As an illustration in the agricultural industry, IoT (Internet of Things) technology has not been adopted massively even though many benefits can be obtained, such as monitoring soil moisture, air temperature, and automatic irrigation management. Likewise, in the fisheries sector, many fish farmers are hesitant to adopt IoT technology because it is considered expensive and not fully understood. It also happens in the livestock sector, where the cost of implementing technology is considered too high for rural farmers. So regarding these findings, it is also proven through research by Ferrari (2022), one of the main factors causing the lag in technology adoption in rural is the high cost and lack of understanding of the long-term benefits that can be obtained from the technology (Ferrari et al., 2022; Leviäkangas et al., 2025). In addition, the mindset of rural communities who are not yet technology literate is also a major barrier. Thus, there needs to be more massive socialisation regarding the benefits of using technology, as well as training programs that focus on empowering farmers, fish farmers, and livestock farmers to utilise technology that is affordable and appropriate to their needs.

Based on the analysis, several reconstructions can be proposed related to the barriers to digitalisation in rural West Java. First, although there have been several collaborative efforts between the government and the private sector, there is still a lack of integration in policies and actualisation that hinders the acceleration of internet infrastructure development. Second, the existing digital literacy program is still ineffective and has not reached all levels of society. The solution is to expand and deepen digital literacy training more evenly across all levels of society and involve more partners in implementing the program.

Later on, to stress the barriers to digital innovation in the economic sector, a more targeted approach is needed by providing more specific training for industries such as agriculture, fisheries, and livestock. Technology introduction programs such as IoT must be adjusted to the local context and needs of these sectors, and the costs involved must be affordable for rural communities. With more coordinated collaboration between the central, provincial, and district/sub-district and the private sector, as well as the implementation of more inclusive solutions based on real needs in the field, digitalisation in rural West Java can develop more effectively, evenly, and sustainably.

Practical Strategies

In this section, we formulate practical strategies for resolving barriers to rural digital initiatives in West Java Province, Indonesia, as follows:

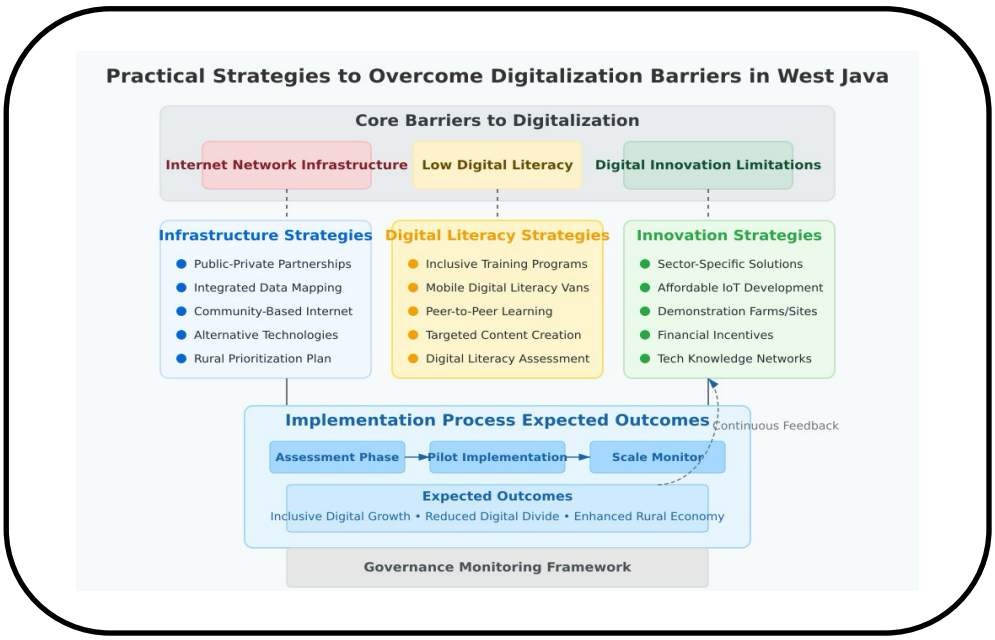

Figure 3. Practical Strategies Model

Source: Author's Visualization

Based on the visualisation above, we suggest following the practical strategies:

1. Infrastructure Strategies

Strengthening West Java's digital infrastructure requires a combination of private-sector involvement, strategic data utilisation, and alternative connectivity solutions. The following key interventions can improve internet accessibility and reliability:

•Public-Private Partnerships (PPPs): Engaging private-sector players to co-invest in digital infrastructure, ensuring cost-efficient and scalable internet expansion.
•Integrated Data Mapping: Identifying connectivity gaps through comprehensive mapping to optimise investment and expansion efforts.
•Community-Based Internet Solutions: Encouraging localised internet-sharing solutions, such as rural-level internet cooperatives, to bridge connectivity gaps.
•Alternative Technologies: Exploring the internet networks and other emerging technologies to extend connectivity to remote areas.
•Rural Prioritization Plan: Develop targeted policies to prioritise digital infrastructure in underdeveloped and rural zones.

2. Digital Literacy Strategies

Even with improved infrastructure, digital transformation will not succeed without a digitally literate population. The following initiatives aim to enhance digital competencies across different demographics:
•Inclusive Training Programs: Establishing training workshops to teach digital skills, from basic internet navigation to advanced digital tools.
•Mobile Digital Literacy Vans: Deploying mobile training centres to rural communities, ensuring education outreach to hard-to-reach populations.
•Peer-to-Peer Learning: Encouraging knowledge transfer through community-based mentorship programs where digitally proficient individuals train others.
•Targeted Content Creation: Developing localised digital content, including educational videos, tutorials, and guides tailored to different user levels.
•Digital Literacy Assessment: Conduct regular assessments to measure digital competency levels and tailor interventions accordingly.

3. Innovation Strategies

The following strategies aim to foster an innovation-friendly ecosystem:
•Sector-Specific Solutions: Developing customised digital solutions for key industries such as agriculture, manufacturing, and tourism to optimise productivity.
•Affordable IoT Development: Promoting low-cost IoT adoption for precision farming, smart logistics, and automated monitoring systems.

•Demonstration Farms/Sites: Creating real-world testing environments where digital innovations can be piloted before large-scale deployment.

•Financial Incentives: Offering grants, subsidies, and tax benefits to encourage digital startups and innovation-driven businesses.

•Tech Knowledge Networks: Establishing collaborative knowledge-sharing platforms where industry players, researchers, and government bodies can exchange insights.

Simultaneously, the successful execution of these strategies requires a structured implementation framework. The process follows a phased approach to ensure continuous monitoring and improvement:

1. Assessment Phase: Conduct an initial evaluation of digitalisation gaps and identify priority areas.
2. Pilot Implementation: Rolling out small-scale interventions to test effectiveness and adaptability.
3. Scale Monitoring: Expanding successful pilot projects while continuously gathering feedback for refinement.

In spite of this, the expected outcomes include:

•Inclusive Digital Growth: Expanding digital access to all communities, ensuring equitable opportunities for engagement.

•Reduced Digital Divide: Bridging the gap between urban and rural populations, enabling widespread digital participation.

•Enhanced Rural Economy: Empowering rural businesses, farmers, and entrepreneurs with digital tools to boost productivity and market reach.

Last, we conclude that overcoming digitalization barriers in West Java requires a well-rounded, thoughtful approach. It's not just about fixing infrastructure or boosting digital literacy; it's about creating an ecosystem where everyone, especially those in rural areas, has the tools, knowledge, and chance to cooperate fully in the digital initiative. Addressing the region's infrastructure gaps, enhancing digital skills, and encouraging innovation are essential first steps, but these need to be paired with a consistent commitment to inclusive public policy. People in rural areas should not just be recipients of technology; they should have a say in how it operates. In this context, when communities are part of the element to assist digital initiatives, policies should focus on local needs and aspirations, whether it's creating tech solutions that fit with traditional ways of life or granting digital chances for everyone in the digital initiative framework.

CONCLUSION

The core message is that digital transformation must be inclusive, not just about rolling out new technology but also about ensuring it benefits everyone, particularly those in underserved rural communities. Although the West Java government has made commendable efforts through the "Rural Digital" initiative and the 2022 regulation that lifted it, the region still faces barriers. These include poor internet infrastructure in many rural, low levels of digital skills among residents, and the limited application of digital tools in key economic sectors like farming, fisheries, and livestock. A lack of funding and coordination between different government levels also slows down progress and affects actualization.

These findings reflect a broader issue: without strategic, inclusive planning, digitalization risks deepening the divide between urban and rural areas. There's a need to focus not just on physical infrastructure but also on building digital skills across all age groups and sectors. Many rural communities still lack the knowledge or confidence to make the most of the internet or modern technologies.

Likewise, the high cost and complexity of digital tools can discourage farmers and small business owners from embracing them. This study makes a key contribution by offering a clear, practical roadmap to address these issues. Through community-based internet solutions, mobile literacy programs targeted digital training and more affordable innovations tailored to local needs. Looking ahead, the success of digitalization in West Java depends on collaborative, sustained action. Stakeholders across all sectors, including government, private companies, community leaders, and civil society, must work together to make sure digital initiatives are effectively delivered and monitored. Solutions need to be localized, cost-effective, and adaptable to the specific challenges rural communities face. But, it requires real commitment, smart planning, and inclusive concretization.

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