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Digitalization of Village-Owned Enterprises in Supporting SDGs in Rural Areas: Opportunities and Challenges in Sigi Regency

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A B S T R A C T

This article examines the complex relationship between the digitalization of Village-Owned Enterprises (BUM Desa) and their contribution to the Sustainable Development Goals (SDGs) in rural areas, focusing on the specific opportunities and challenges in Sigi Regency, Central Sulawesi. Based on a qualitative case study methodology, the research identifies that digitalization offers significant opportunities for BUM Desa, including expanding market reach, improving operational efficiency and transparency, and increasing access to capital. These opportunities directly support several SDGs, such as poverty eradication (SDG 1), equitable economic growth (SDG 8), and strengthened partnerships (SDG 17). However, the findings also highlight that realizing this potential is significantly hampered by fundamental challenges in Sigi Regency. These challenges include limited human resource capacity and digital literacy, uneven digital infrastructure, insufficient capital and small business scale, suboptimal organizational management, and a lack of coordination among stakeholders. The study concludes that while digitalization is a powerful tool, its effectiveness is highly dependent on a strong foundation of capacity and governance. Without addressing these structural issues, digitalization risks widening existing disparities or failing to deliver the expected transformative impact. This research provides a nuanced understanding of how digitalization, BUM Desa, and SDGs interact in a challenging socioeconomic and geographical context, emphasizing the need for a holistic and tailored digitalization strategy that combines technological investment with human capacity building and institutional strengthening.

1. Introduction

1.1 Background

The Sustainable Development Goals (SDGs) agenda encompasses economic, social, and environmental dimensions, with 17 goals to be achieved by 2030. This emphasizes the need for concrete action to address various global challenges, including eradicating poverty, inequality, climate change, environmental degradation, and creating peace and justice. Indonesia has demonstrated its commitment to this agenda by integrating these goals into the "SDGs Desa" framework, which is a tailored framework for sustainable village development. A substantial financial commitment is further evidenced by the 2024 Village Fund of IDR 71 trillion, which has been allocated to 15,124 villages, as regulated in the Minister of Finance Decree Number 352 of 2024 concerning the Details of Village Incentives per Village for the 2024 Fiscal Year [1].

Village-Owned Enterprises (BUM Desa) have long been recognized as a vital instrument for strengthening rural economies and improving community welfare. As a legal village economic institution, BUM Desa are established and owned by the Village Government, managed independently and professionally with capital mostly derived from separated village assets. The primary goal of BUM Desa is to generate profit that can strengthen Village Original Revenue (PADes), advance the village economy, and create jobs, thereby contributing to local unemployment reduction. The legal framework underpinning the establishment and operation of BUM Desa in Indonesia is very clear, as regulated in Law Number 6 of 2014 concerning Villages and Government Regulation Number 43 of 2014 [2].

Digital transformation has now become an inevitability that influences various aspects of life, including in rural areas. The concept of a digital village refers to a rural area that has comprehensively adopted digital technology to improve the welfare and advance the lives of the local community. The implementation of this digitalization creates various opportunities, ranging from improved accessibility and connectivity and economic empowerment through digital platforms to innovation in public services and enhanced education and training for the village community.

The digitalization of BUM Desa specifically has significant potential to support the achievement of the Sustainable Development Goals (SDGs) at the village level. The SDGs consist of 17 global goals grouped into four pillars of sustainable development: the Social Development Pillar, the Economic Development Pillar, the Environmental Development Pillar, and the Pillar of Law and Governance. BUM Desa, through its various business forms, can contribute directly to achieving the SDGs at the village level.

Sigi Regency, located in Central Sulawesi, has distinctive characteristics with abundant natural resources and cultural heritage. In 2024, the region recorded positive economic growth of 3.50 percent, along with an increase in the Human Development Index (HDI) to 70.90 [3]. The Sigi Regency government shows a strong commitment to digital transformation, as seen from the launch of the Telkom Smartcity network in 2017, as well as various initiatives taken by the Communication and Information Agency (Diskominfo) to activate village websites and provide internet access in 3T (frontier, outermost, and disadvantaged) areas. However, challenges in the equitable distribution of telecommunication infrastructure and the increased capacity of human resources for managing BUM Desa in remote areas remain important issues that need to be addressed [4].

The context of Sigi Regency must also be understood from a post-disaster perspective. The region experienced a significant earthquake and liquefaction in 2018, which resulted in major losses. This incident highlights the region's vulnerability to external shocks. The push for "green investment" and "sustainable jurisdictional development," as well as various digitalization initiatives carried out by the local government, indicate that digitalization is considered a key strategy for building resilience and ensuring sustainable development.

Digitalization can improve resilience in several ways. Digital administrative and economic services, such as creating online letters or e-commerce platforms, can ensure the continuity of village functions and market access even if physical infrastructure is disrupted or mobility is limited. Digital platforms can also facilitate the dissemination of important information regarding disaster preparedness and response. In addition, economic diversification through digitalization,

such as marketing local products online, can reduce dependence on sectors that are vulnerable to physical shocks. This initiative directly supports the Sustainable Development Goals (SDGs), which focus on building resilience for poor and vulnerable communities against climate-related extreme events, disasters, and other economic, social, and environmental pressures [5]. Thus, the digitalization of BUM Desa in Sigi Regency is not only oriented towards economic growth or efficiency but is also a crucial element in the post-disaster recovery and long-term resilience-building strategy, making development more inclusive and sustainable in the face of potential future shocks.

1.2 Problem Statement

Based on the presented background, this study identifies two main research questions:

1. How can the digitalization of BUM Desa in Sigi Regency create opportunities to support the achievement of the SDGs?
2. What are the key challenges faced in the implementation of BUM Desa digitalization in Sigi Regency in the context of supporting the SDGs?

1.3 Objectives and Scope

This research aims to analyze the potential of BUM Desa (Village-Owned Enterprises) digitalization in supporting the achievement of the Sustainable Development Goals (SDGs) in Sigi Regency. The analysis focuses on improving accessibility, economic empowerment, innovation in public services, and job creation. Furthermore, this study also aims to identify and analyze the challenges faced in the implementation of BUM Desa digitalization in Sigi Regency, including infrastructure constraints, human resource capacity, and data security and privacy issues.

The scope of this research is focused on the digitalization of BUM Desa in Sigi Regency, Central Sulawesi. The analysis will be conducted through a systematic literature review covering various relevant sources, including laws and regulations, scientific journals, government reports, and news articles. This study will emphasize the opportunities and challenges of BUM Desa digitalization within the context of the four pillars of the SDGs: Social, Economic, Environmental, and Law and Governance. This study is based on the synthesis of secondary data already available in the relevant literature.

2. Literature Review

A Village-Owned Enterprise (BUM Desa) is an economic entity that plays a crucial role at the village level. A BUM Desa is established and owned by the Village Government, with its capital largely derived from separated village assets. BUM Desa are managed independently and professionally, with the primary objectives of generating profit to strengthen the Village's Original Revenue (PADes), stimulating the village's economic growth, and improving the welfare of the local community. The functions of a BUM Desa include serving as the main driver of the village economy and as an institution for managing village assets. Various types of businesses can be run by a BUM Desa, such as social businesses providing public services, goods rental, intermediary services (like electricity payments), distribution of staple goods, trading of agricultural products, as well as local industries and handicrafts. It is important to choose an appropriate legal entity form, such as a Village Public Corporation (Perumdes) or a Village Limited Liability Company (Persero Desa), to ensure the legality and operational sustainability of the BUM Desa [6].

2.1 Related Work

Describe Village-Owned Enterprises (BUM Desa) have become a critical topic contributing to the achievement of the Sustainable Development Goals (SDGs), particularly in the context of local economic development in Sigi Regency. Recent research findings indicate that digitalization not only improves operational efficiency but also plays a vital role in empowering village communities, creating economic opportunities, and addressing existing challenges.

A study by Guntoro et al. (2024) explores how the digitalization of marketing can enhance the competitiveness of Micro, Small, and Medium Enterprises (MSMEs) in Sukabumi. The study found that implementing digital technology in marketing can expand market reach and increase sales of local products. This is highly relevant for BUM Desa in Sigi, as it can enable them to market their local products more effectively [7]. Furthermore, Irfan and Anirwan's (2024) literature review on village digitalization identified various opportunities and challenges. They concluded that government policy support is essential to drive effective digitalization, and that digital literacy is crucial for communities to leverage available technology [8]. This suggests that BUM Desa in Sigi must develop strategies that include enhancing the digital literacy of their members to optimize their potential.

From an institutional perspective, Muizu's research (2023) demonstrates that strong village-level institutions are instrumental in the development of BUM Desa. The study emphasizes that community involvement in the management of these village institutions is a key determinant of success for digital initiatives [9]. Therefore, BUM Desa in Sigi Regency needs to encourage active community participation to achieve more inclusive development goals. In addition, a study by Bantara et al. (2024) shows that sound financial management in BUM Desa significantly impacts their economic performance. This research highlights the importance of training in digital-based financial management, particularly to support transparency and accountability in fund usage [10]. In Sigi's context, optimizing digital financial systems in BUM Desa will strengthen public trust and support the long-term sustainability of their operations.

Taptajani et al. (2023) further underscore the importance of digital literacy in empowering communities in the 4.0 era. Their research reveals that digital literacy should be a primary focus in community development programs to enable residents to compete in an increasingly competitive market [11]. In Sigi Regency, digital skills training for BUM Desa members could help them more effectively market products and services while addressing the challenges posed by digitalization.

Following this, Ningsih and Anggraeni (2023) highlight that the accountability of village fund management is significantly influenced by a robust financial system. The study shows that the implementation of an accountable financial system strengthens transparency and public trust in the management of village funds [12]. This is also critical for BUM Desa in Sigi to maintain a positive relationship between management and the village community.

In terms of human resource management, Gulo et al. (2024) investigated how the utilization of human resources in BUM Desa can improve their performance and development. Their findings suggest that human resource management must be a primary focus for the development of BUM Desa [13]. Technology-oriented human resource development can enhance the skills of BUM Desa members and increase their operational efficiency.

Subsequently, Aisyah et al. (2024) researched how digitalization strategies for developing MSMEs need to bring products closer to consumers, especially in a digital context. Focusing on product branding through digital media can increase the visibility of MSME products [14]. In this regard, BUM Desa in Sigi Regency needs to implement effective digital marketing strategies to attract consumers, both locally and from outside the region.

The success of BUM Desa's digital marketing strategies is also supported by Rochman and Choiriyah's research (2024), which emphasizes the importance of local governance in smart village development. This study shows that collaboration between the village government and the community is crucial for creating a supportive structure for successful digitalization [15]. This is vital for BUM Desa in Sigi to build sustainable strategic partnerships with various stakeholders.

Overall, the existing research findings indicate that the digitalization of BUM Desa in Sigi Regency can serve as a means to improve the quality of life, overcome economic challenges, and support the achievement of the SDGs. An inclusive approach, comprehensive training, and collaboration among all stakeholders are key to realizing this vision.

In the context of achieving the SDGs in villages, BUM Desa plays a crucial role. They function as the primary vehicle for implementing various programs that support the achievement of the 17 SDG goals, which are structured around four pillars of sustainable development. This demonstrates a close link between BUM Desa and digitalization initiatives in enhancing the accountability and transparency of village fund management, as well as contributing to more equitable economic growth in rural areas (Putra et al., 2023) [16].

The digitalization of BUM Desa has proven effective in supporting poverty alleviation (SDG 1) and food security (SDG 2) by optimizing the economic potential of the village. Through digitalization, the marketing of local agricultural products can be accessed more widely and efficiently, thus increasing farmers' income and creating employment opportunities (Megavitry et al., 2024) [17]. BUM Desa also plays a role in educating the community on business management, skill enhancement, and the provision of affordable goods and services to villagers, all of which are key steps in alleviating poverty (Putra et al., 2023) [16].

From an economic perspective, digitalization is vital in promoting sustainable and inclusive economic growth, creating decent jobs (SDG 8), and fostering innovation (SDG 9) in villages. By leveraging digital technology, BUM Desa can enhance the competitiveness of local products, which in turn contributes to reducing social and economic inequalities (SDG 10) (Mutmainnah & Utomo, 2024) [18]. These efforts not only accelerate local economic growth but also position villages as important contributors to the national economy (Putra et al., 2023) [16].

In the environmental context, the digitalization of BUM Desa influences the management of village resources in a more effective and sustainable way (SDG 11). The use of digital-based information systems allows for better management of responsible consumption and production patterns (SDG 12). Through professional digital governance, villages can optimize natural resources and minimize negative environmental impacts an approach that is increasingly important amid current climate change challenges (Megavitry et al., 2024) [17].

Equally important are the legal and governance aspects, which are also improved through digitalization. The process of digitalization enhances transparency and accountability in the

management of village funds and public services, which are essential prerequisites for strengthening institutions that can support the achievement of SDG 17. This effort aligns with the need to build responsive and reliable institutions, ensuring that the development undertaken by BUM Desa brings maximum benefits to the village community (Putra et al., 2023) [16].

In conclusion, the connection between BUM Desa and digitalization is directly linked to the achievement of various SDG targets. By leveraging digital technology, BUM Desa not only strengthens the economic and social foundations of the village but also contributes to food security, poverty alleviation, the creation of a sustainable environment, and the establishment of good governance and the rule of law. Through effective collaboration among the government, community, and stakeholders, the management of BUM Desa can be optimized to drive the achievement of the desired sustainable development goals. relevant studies that others have conducted in this area, noting similarities and differences to your work.

2.2 Research Gap

Identify Although existing literature has explained the role of Village-Owned Enterprises (BUM Desa) in rural economic development and discussed village digitalization in general, there are limitations in studies that specifically analyze the opportunities and challenges of BUM Desa digitalization in supporting the achievement of the Sustainable Development Goals (SDGs) in specific geographical and socioeconomic contexts, such as in Sigi Regency. Previous research tends to focus on the success of technology implementation or general economic impacts, but it lacks an in-depth exploration of the relationship between BUM Desa digitalization and various specific targets across the four pillars of the SDGs. It also fails to examine how local challenges, such as the conditions of remote, frontier, and outermost regions (3T) in Sigi, impact this process.

Existing case studies from other regions in Indonesia provide a general overview of BUM Desa digitalization initiatives. However, these studies may not fully reflect the unique nuances found in Sigi Regency, which has post-disaster characteristics and a significant presence of 3T regions. This indicates that while an understanding of digitalization and the SDGs exists, the "how" and "why" of digitalization succeeding or failing in a challenging and specific context like Sigi still needs to be explored more deeply.

This gap emphasizes the importance of shifting from a general national narrative to more detailed and contextual research. A systematic review focused on Sigi, which synthesizes existing literature through the lens of the Sigi context, can provide more specific and applicable insights for local policymakers and BUM Desa. A deeper understanding of the implementation of BUM Desa digitalization in areas with unique challenges like Sigi Regency is crucial for formulating appropriate interventions to achieve the SDGs at the sub-national level, especially in a diverse archipelagic country like Indonesia. This study aims to fill that gap by presenting a comprehensive analysis of the opportunities and challenges of BUM Desa digitalization in Sigi Regency in supporting the SDGs, based on a systematic literature review.

3. Methodology

3.1 Data Collection

Data collection was carried out through the process of identifying, selecting, and extracting information from various relevant secondary sources. These sources included:

1. Laws and Regulations: Legal documents related to Village-Owned Enterprises (BUM Desa), such as Law No. 6 of 2014, Government Regulation No. 43 of 2014, and Government Regulation No. 11 of 2021, as well as regulations concerning the SDGs in Indonesia.
2. Scientific Journals: Research articles discussing the digitalization of BUM Desa, the role of BUM Desa in achieving the SDGs, case studies of digitalization at the village level, and the opportunities and challenges faced.
3. Government Reports and Public Policies: Official documents published by relevant ministries, such as the Ministry of Villages, Disadvantaged Regions Development, and Transmigration (Kemendes PDTT), Diskominfo Sigi, and the Supreme Audit Agency (BPK), as well as other government agencies that explain village digitalization initiatives, infrastructure conditions, and SDG achievements in Sigi Regency.
4. Reputable News Articles and Media Publications: News and analyses from highly credible media outlets reporting on the progress of digitalization in Sigi Regency, BUM Desa initiatives, and other relevant issues.details on the sources of data, sampling methods, or experimental setups.

3.2 Analysis Techniques

The qualitative data obtained from the literature review will be analyzed using a combination of content analysis, thematic analysis, and the Miles and Huberman model.

1. Content Analysis: This technique aims to identify patterns, keyword frequency, and recurring themes within the text. The collected data will be grouped into similar units or themes and then analyzed to understand the representation and emphasis on specific issues related to BUM Desa digitalization and the SDGs.
2. Thematic Analysis: This approach focuses on identifying recurring themes and patterns in the data and is more flexible and interpretive. The experiences, perspectives, and narratives found in the literature will be examined in depth to understand the breadth and diversity of perspectives on the opportunities and challenges of BUM Desa digitalization. This process involves coding the data to uncover recurring concepts and ideas.
3. Miles and Huberman Model: This technique will be applied to ensure a systematic and structured approach to data analysis. This process includes data reduction (summarizing and selecting relevant data), data display (organizing data into easy-to-understand tables or narratives), and conclusion drawing (interpreting emerging patterns and themes).

3.3 Validation

Source data triangulation will be used to ensure the veracity of information will be explored and verified through various data collection sources. For example, information regarding digitalization initiatives in Sigi Regency obtained from government reports will be compared and confirmed with news articles or scientific journals that discuss the same topic. The comparison of information from various perspectives and types of documents (such as regulations and case studies in scientific articles) is expected to produce more reliable and accurate findings. This step helps to verify data consistency and reduce potential bias that may exist in a single source.

4. Results and Discussion

4.1 Key Findings

Based on a literature analysis within the context of Sigi Regency, the digitalization of Village-Owned Enterprises (BUM Desa) offers significant opportunities to support the achievement of the Sustainable Development Goals (SDGs). However, this process also faces a number of key challenges.

Table 1: SDGs Relevant to BUM Desa Digitalization And Village Development.

Pillar of Sustainable Development	Relevant SDGs	Linkage to BUM Desa Digitalization and Village Development
Social Pillar	SDG 1: No Poverty	BUM Desa digitalization can increase community income through expanding local product markets (e-commerce) and creating new jobs, as well as facilitating access to basic services.
	SDG 2: Zero Hunger	Online marketing of local agricultural products can increase the productivity and income of small-scale farmers, as well as improve food access.
	SDG 3: Good Health and Well-Being	The digitalization of health center services and health information can improve the access and quality of health services.
	SDG 4: Quality Education	Internet access and online education platforms increase learning opportunities and the digital skills of the community.
	SDG 5: Gender Equality	Digitalization can empower women through digital skills training and access to online business opportunities.
Economic Pillar	SDG 8: Decent Work and Economic Growth	BUM Desa digitalization promotes inclusive economic growth, creates new jobs in the digital and non-agricultural sectors, and increases the competitiveness of local products.
	SDG 9: Industry, Innovation, and Infrastructure	The development of digital infrastructure (internet networks, BTS towers) supports sustainable industrialization and innovation in villages.
	SDG 10: Reduced Inequalities	Equitable digital access and increased digital literacy can reduce economic and social inequality between urban and rural areas.
Environmental Pillar	SDG 11: Sustainable Cities and Communities	Digitalization supports more effective, transparent, and sustainable village governance and facilitates inclusive settlement planning.
	SDG 12: Responsible Consumption and Production	BUM Desa digitalization can promote sustainable and efficient business practices in the use of natural resources and increase community awareness.
	SDG 15: Life on Land	Digitalization can support the sustainable management of natural resources and prevent the degradation of terrestrial ecosystems through monitoring and information.
Law and Governance Pillar	SDG 17: Partnerships for the Goals	Digitalization improves the transparency and accountability of village fund management, strengthens village institutions, and encourages multi-stakeholder collaboration.

Table 2: Opportunities for BUM Desa Digitalization and SDGs in Sigi Regency

Key Opportunities	Description and Linkage
Increased Accessibility and Connectivity	The development of digital infrastructure such as a dedicated internet network (Astinet 100 Mbps) by Telkom, the desa.id domain service, and internet access assistance at 36 3T points by the Sigi Regency Government and BAKTI open the door for various digital services. This increases access to information, online education, and health services for the people of Sigi.
Village Economic Empowerment (Local E-commerce)	Digitalization allows local producers in Sigi, such as Dombu coffee and other MSME products, to market their products online to a wider market (national and even international). This increases village income and economic competitiveness, supporting SDG 8. The "UMKM Go Digital" program in Lonca Village is an example of this initiative.
Innovation in Public Services and Village Administration	The implementation of free village websites by Diskominfo Sigi and other e-government services (cloud accounts, local government email, subdomains) enables faster, easier, and more transparent services and administration (e.g., online letter creation, village fund monitoring via Siskeudes). This supports SDG 11 and 17.
Increased Skills and Knowledge (Digital Literacy)	Digital skills training programs for the community and BUM Desa managers enable them to manage their businesses more effectively and participate in the digital economic ecosystem, supporting SDG 4.
New Job Creation	The development of digital villages encourages the creation of new jobs, both in the technology sector and other sectors that support the digital economy, such as managing e-commerce platforms and delivery services, supporting SDG 8.
Increased Transparency and Accountability	The digitalization of village fund management through village financial system dashboards and digital BUM Desa financial reporting increases transparency and accountability, supporting SDG 17.

Table 3: Challenges of BUM Desa Digitalization and SDGs in Sigi Regency

Key Challenges	Description and Linkage
Limited Digital Infrastructure	Many villages in Sigi, especially in 7 remote districts (Marawola Barat, Nokilalaki, Lindu, Kinovaro, Kulawi, Pipikoro), still face problems with unstable or non-existent electricity access, as well as inadequate internet connections or even no cellular signal. This hinders the implementation and use of digital technology.
Limited Knowledge and Skills (Digital Literacy)	Low digital literacy among the village community, especially the older generation, is a barrier to the use of technology. BUM Desa managers are also often not skilled in computer technology and online business management.
Suboptimal Capacity of BUM Desa Manager Human Resources	The improper placement of BUM Desa administrators or managers, often based on proximity rather than competence, hinders the smooth operation and financial reporting. A lack of understanding of the direction and goals of the BUM Desa is also a problem.

Data Security and Privacy	With the adoption of digital technology, risks related to personal data protection increase. BUM Desa must implement adequate policies and systems to protect the data of village residents from cyber security threats.
Implementation Costs and Financial Sustainability	Investment budgets for providing digital infrastructure and applications can be very high. Financial sustainability challenges arise if digital programs do not generate enough revenue to cover operational costs (case example of Ngojol in Krandegan).
Cultural and Mindset Changes	Adapting from traditional to online business requires a change in the mindset and habits of the community and BUM Desa managers. Resistance to change can hinder the adoption of technology.

4.2 Interpretation of Results

This section discusses the significance of the findings, especially in relation to the research objectives. The above findings show that the digitalization of Village-Owned Enterprises (BUM Desa) in Sigi Regency has significant transformative potential in supporting the achievement of the Sustainable Development Goals (SDGs). The improvement of accessibility and connectivity through the development of fundamental digital infrastructure is a crucial foundation that allows villages to engage in the digital economy and improve public services. The initiatives of the Sigi Regency government, such as the launch of Telkom Smartcity and internet access assistance programs, are strategic steps that reflect a commitment to the digitalization agenda. This directly supports SDG 9 (Industry, Innovation, and Infrastructure) by building a solid technological foundation.

The opportunity for village economic empowerment through local e-commerce is very significant, especially for Sigi's superior products like Dombu coffee and other micro, small, and medium enterprises (MSMEs). The ability to market products online not only expands the market reach but also increases community income and the competitiveness of local products, which contributes directly to SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth). In addition, innovation in public services through village websites and other e-government services increases the efficiency and transparency of village administration, in line with SDG 11 (Sustainable Cities and Communities) and SDG 17 (Partnerships for the Goals).

However, the implementation of BUM Desa digitalization in Sigi faces complex challenges. Limited digital infrastructure, especially in frontier, outermost, and disadvantaged (3T) areas, remains a major obstacle. Although there are efforts to provide internet access, network speed and stability are still issues that can disrupt the smooth flow of digital economic activities and access to information. This shows that the development of physical infrastructure must continue to be a priority to ensure equitable digital access.

Furthermore, the limited digital knowledge and skills (digital literacy) among the community and BUM Desa managers are serious challenges. The lack of human resource (HR) capacity in managing technology and online business, as well as the placement of BUM Desa administrators that is not always based on competence, hinders the optimization of digitalization potential. This indicates that investment in infrastructure development must be balanced with continuous and relevant digital literacy training and education programs tailored to local needs. Without an increase in HR capacity, the existing infrastructure may not be utilized to its maximum potential.

Data security and privacy aspects are also an important concern in the digitalization era. BUM Desa need to ensure the protection of personal data and secure systems from cyber threats to build public trust in digital platforms. Finally, the high implementation costs and financial sustainability challenges of digital programs, as seen in cases outside of Sigi, require mature business planning and clear revenue models for BUM Desa. Changes in the culture and mindset of the community and managers are also crucial for successful technology adoption.

Overall, the digitalization of BUM Desa in Sigi Regency is a promising effort to accelerate the achievement of the SDGs, especially in the economic and social aspects. However, this success is highly dependent on the ability to overcome fundamental challenges related to infrastructure, HR capacity, and governance.

5. Discussion

5.1 Comparison with Prior Research

This section highlights how your findings align with or contradict previous research. The findings of this study are in line with various case studies on the digitalization of Village-Owned Enterprises (BUM Desa) in Indonesia, which show the significant potential of technology in improving the village economy and public services. Cases in Kendal Regency, Sumberpucung District, and Cibiru Wetan Village confirm that digitalization can expand market reach, improve management efficiency, and support the achievement of Sustainable Development Goals (SDGs) related to poverty alleviation and food security. The SAKU BUM Desa application also shows that digitalization in business feasibility analysis can encourage equitable village economic growth. This strengthens the argument that BUM Desa digitalization is an effective strategy for sustainable development.

However, this research also highlights challenges that are in line with findings in other regions, especially regarding infrastructure and human resource capacity. The case of Krandegan Village in Purworejo, despite its success in digital administrative services (Sipolgan), faced obstacles with its digital economic applications (Toko Desaku and Ngojol) due to human resource and financial sustainability issues. A similar situation also occurred in the BUM Desa of Ampera Village, Sigi Regency, where the improper placement of human resources and the lack of computer skills among managers were major inhibitors. The challenge of uneven digital infrastructure in frontier, outermost, and disadvantaged (3T) areas in Indonesia, including Sigi, has also been identified in other literature as a fundamental barrier to the implementation of non-cash transactions and digitalization in general.

This comparison affirms that although the potential of BUM Desa digitalization is universal, its successful implementation is highly dependent on the local context. Regions like Sigi Regency, with their challenging geographical characteristics and post-disaster development needs, require a more focused and sustainable approach to addressing infrastructure and human resource capacity gaps. Case studies in Java, while providing examples of success, may not fully reflect the complexity of the challenges faced in Sigi, which requires a more in-depth and specific understanding of the context.

5.2 Limitations

This section acknowledges any limitations that may have influenced your research. This study has several limitations that need to be acknowledged. First, this research is based entirely on a systematic literature review of secondary data. This indicates that the findings presented are a

synthesis of existing information and do not involve the direct collection of primary data from the field in Sigi Regency. Therefore, specific nuances and dynamics that may only be captured through in-depth interviews or participatory observation with local stakeholders (such as BUM Desa managers, the community, and the village government) may not be fully represented. Second, although maximum efforts have been made to identify and analyze relevant literature, the availability of specific data on BUM Desa digitalization in all villages in Sigi Regency may be limited. Some initiatives may not have been widely documented in scientific journals or public reports, which can affect the completeness of the picture presented. Third, the qualitative nature of this literature review allows for an in-depth understanding of "how" and "why" phenomena occur, but it does not provide quantitative data that can be generalized or used to measure impact statistically.

5.3 Future Research

This section suggests potential areas for further research or improvements to the research design. Based on the findings and limitations of this study, several potential areas for further research can be suggested as follows:

1) In-Depth Empirical Study in Sigi Regency: Conduct field research with a qualitative approach (in-depth interviews, Focus Group Discussions, observation) in several BUM Desa in Sigi Regency. This will provide rich primary data, allowing for a deeper understanding of the direct experiences, perceptions, and specific needs of BUM Desa managers and the community related to digitalization.
2) Quantitative Impact Analysis: Develop quantitative research to measure the impact of BUM Desa digitalization on specific SDG indicators in Sigi Regency, such as increased income, job creation, or service efficiency.
3) Comparative Study of Success and Failure: Conduct a comparative study between successful and less successful BUM Desa in digitalization in Sigi, to identify more specific key success factors and obstacles.
4) Development of Intervention Models: Design and test intervention models or assistance programs tailored to increase the digital literacy and human resource capacity of BUM Desa managers in 3T areas, while considering existing infrastructure challenges.
5) Financial Sustainability Analysis of BUM Desa Digital Models: Research business models and financial sustainability strategies for BUM Desa digital platforms, especially in the context of areas with limited resources.Suggest potential areas for further research or improvements to the study design.

6. Conclusion

This section summarizes the main points of the paper, including the problem, methodology, findings, and implications. It emphasizes the contribution of this research to the related field. This study has analyzed the digitalization of Village-Owned Enterprises (BUM Desa) in supporting the Sustainable Development Goals (SDGs) in Sigi Regency, using a qualitative approach through a systematic literature review. BUM Desa are a fundamental pillar in village economic development, and digitalization offers significant opportunities to accelerate the achievement of the SDGs. The main findings show that the digitalization of BUM Desa in Sigi Regency has great potential to improve accessibility and connectivity, empower the local economy through e-commerce, innovate public services, increase the digital skills of the community, create new jobs, and strengthen the transparency and accountability of village fund management. The local government's initiatives in building digital infrastructure and activating village websites are positive steps in this direction.

However, this great potential is faced with substantial challenges, especially limited digital infrastructure that is not yet evenly distributed in remote areas, low digital knowledge and skills among the community and BUM Desa managers, and suboptimal human resource capacity of BUM Desa managers. Data security and privacy issues, as well as the financial sustainability of digital initiatives, are also important concerns. The contribution of this research lies in its comprehensive synthesis of the opportunities and challenges of BUM Desa digitalization within the specific context of Sigi Regency, which has post-disaster and 3T area characteristics. This research reinforces that the success of BUM Desa digitalization does not only depend on the availability of technology but also on the village's internal readiness in terms of human resources, management, and good governance. This shows that digitalization can be an indicator of a village's maturity towards economic independence and effective governance, which are important foundations for the holistic achievement of the SDGs.

7. Recommendation

Based on the findings and conclusions of this study, the following strategic recommendations are suggested to optimize the digitalization of BUM Desa in supporting the SDGs in Sigi Regency:

1) Prioritize the Development and Equitable Distribution of Digital Infrastructure: The Sigi Regency government, in collaboration with the central government (Kemenkominfo, BAKTI) and the private sector (Telkom), must accelerate the development and equitable distribution of digital infrastructure, especially fast and stable internet access, as well as adequate electricity supply in all villages, particularly in 3T areas. This is a fundamental prerequisite for the success of BUM Desa digitalization.
2) Increase the Digital Literacy and Capacity of BUM Desa Managers and the Community: Design and implement comprehensive and continuous digital training programs for BUM Desa managers, covering online business management, digital marketing, digital financial management, and the use of public service applications. Provide digital literacy training tailored for various community groups, including the older generation, to ensure inclusivity in the village digital ecosystem. Improve the recruitment process for BUM Desa managers so that it is based on competence and ability, not just proximity.
3) Develop Relevant and Sustainable BUM Desa Digital Platforms: Encourage the development of user-friendly and integrated local e-commerce platforms, focusing on the village's superior products and local MSMEs. Ensure that existing village administrative service platforms (e.g., village websites) are utilized to their maximum potential for transparency and service efficiency. Develop clear and sustainable business models for BUM Desa digital initiatives, including realistic funding and revenue mechanisms, to avoid financial sustainability issues.
4) Strengthen BUM Desa Digital Governance and Accountability: Implement a transparent and accountable digital-based financial and operational reporting system for BUM Desa, in accordance with applicable accounting standards and regulations. Strengthen data security and privacy policies and systems to protect the personal information of the community and digital transactions.
5) Encourage Multi-Stakeholder Collaboration: Facilitate strong partnerships between the local government, BUM Desa, academics (universities), the private sector, and civil society organizations. This collaboration is important for sharing knowledge, expertise, technology, and financial resources. Utilize experiences from successful BUM Desa digitalization case studies in other regions of Indonesia, but adapt these strategies to the specific context and needs of Sigi Regency.
6) Integrate BUM Desa Digitalization into Post-Disaster Regional Development Strategies: Sigi can position BUM Desa digitalization as a key component in its post-disaster resilience

development strategy, ensuring the continuity of village services and the economy even in emergency conditions. Utilize digital platforms for the dissemination of information related to disaster preparedness and response coordination.

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