

Digital Transformation and AI Readiness for Strengthening Rural Economic Resilience: a BUMDes Case Study

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Received: 2026, 07,12 Accepted: 2026, 08,22
Available online: 2026, 08,25

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KEYWORDS	ABSTRACT
Keywords: artificial intelligence; BUMDes; digital transformation; rural economic resilience; village-owned enterprises. Conflict of Interest Statement: The author(s) declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. Copyright ©2026 Vifada Management and Digital Business. All rights reserved.	Purpose: This study examines how digital transformation within BUMDes Agung Manunggal contributes to rural economic resilience in Kebonagung Village and explores the readiness, potential applications, and strategic role of artificial intelligence (AI) in strengthening BUMDes competitiveness and organizational effectiveness. Research Method: A qualitative case study was conducted in Kebonagung Village, Imogiri, Bantul, Special Region of Yogyakarta, Indonesia. Data were collected through in-depth interviews with BUMDes managers, village government representatives, business-unit managers, and relevant stakeholders, complemented by observation and documentation. Data were analyzed using an interactive qualitative analysis and thematic approach, with source and method triangulation applied to enhance the credibility of the findings. Results and Discussion: The findings reveal that BUMDes Agung Manunggal is at an early stage of digital transformation. Digital technologies are currently used for administration, financial transactions, and promotion, but remain fragmented and have not been fully integrated across business units. AI has not yet been formally implemented; however, participants identified its potential for digital marketing, customer service, business analysis, reporting, and operational support. Human-resource capability emerged as the primary barrier to further digital transformation. BUMDes contributes to rural economic resilience through essential service provision and the potential strengthening of local production, distribution, and economic circulation. Implications: BUMDes should prioritize digital skills, system integration, formal digital policies, younger workforce involvement, and external collaboration before gradually adopting AI-based solutions. Originality: This study provides a village-level perspective linking digital transformation, emerging AI readiness, BUMDes institutional capability, and rural economic resilience, emphasizing AI as a prospective capability rather than an already realized economic intervention.

1) Introduction

Sustainable national economic development increasingly depends on the capacity of rural communities to create productive economic activities, strengthen local institutions, and adapt to socioeconomic and technological changes. This issue is particularly important in Indonesia, where disparities between rural and urban areas remain a persistent development challenge. In 2024, the poverty rate in rural areas reached 11.79%, substantially higher than the 7.09% recorded in urban areas ([Badan Pusat Statistik \[BPS\], 2024](#)). This disparity indicates that economic growth has not been distributed evenly across regions and highlights the vulnerability of rural communities to limited employment opportunities, restricted market access, inadequate infrastructure, and external economic shocks. Strengthening rural economic resilience is therefore essential for achieving inclusive and sustainable development.

Within this context, Village-Owned Enterprises (Badan Usaha Milik Desa [BUMDes]) have emerged as strategic economic institutions for mobilizing local resources, developing village-based businesses, generating village revenue, and improving community welfare. BUMDes are expected to function not merely as profit-oriented enterprises but also as institutional mechanisms through which villages can transform local assets and economic potential into sustainable sources of community income. Previous studies have demonstrated that effective BUMDes management can contribute to village-generated revenue and local economic development ([Sasongko & Ngabiyanto, 2020](#)). Nevertheless, the ability of BUMDes to generate sustainable economic value varies considerably because many village enterprises continue to experience weaknesses in managerial capacity, financial administration, human resources, market development, and technological utilization ([Tarlani et al., 2023](#)).

These challenges have become increasingly important as economic activities shift toward digital ecosystems. Digital transformation is not simply the adoption of individual information technologies but represents an organizational process through which digital technologies reshape business processes, organizational capabilities, customer interactions, and mechanisms of value creation (Vial, 2019). Digital transformation may progress from basic digitization toward broader digitalization and ultimately organizational transformation, requiring changes in strategy, capabilities, structures, and business models ([Verhoef et al., 2021](#)). Consequently, rural enterprises that rely predominantly on conventional business processes may face increasing difficulties in maintaining competitiveness, expanding markets, and responding to rapidly changing consumer behavior.

Recent studies have begun to demonstrate the potential contribution of digitalization to BUMDes development. Digital technologies can facilitate marketing, financial administration, information management, transparency, and the delivery of services to rural communities. For example, digital transformation can improve the bargaining position of rural producers by expanding their access to market information and distribution channels ([Taufikurahman et al., 2026](#)). Similarly, the use of digital marketing and e-commerce has been associated with improved market access and greater competitiveness of village products ([Mudjiyanti et al., 2022](#)). Empirical evidence also indicates that digital marketing communication, management information systems, digital literacy, and institutional support can positively contribute to the economic performance and competitiveness of BUMDes ([Erwin & Amri, 2024](#)).

Digitalization can also strengthen the internal governance of village enterprises. Information systems enable BUMDes managers to integrate administrative, financial, operational, and business-unit information, thereby improving organizational efficiency and service delivery ([Buchori et al., 2024](#)). More recent evidence indicates that transitioning from manual to digital accounting systems can strengthen accountability and decision-making, although implementation may remain partial when digital systems are inconsistent with the working practices and capabilities of BUMDes managers ([Fatimah et al., 2026](#)). Similarly, integrated digital platforms have been developed to address inefficient financial management, fragmented business processes, and limited marketing capabilities within BUMDes ([Yunanto et al., 2026](#)). These findings suggest that digital transformation provides opportunities to strengthen both the operational and market dimensions of village enterprises.

However, technological adoption in rural areas does not automatically generate economic benefits. Rural digital transformation is shaped by the interaction between technological infrastructure, human capabilities, institutional arrangements, and socioeconomic conditions. Research on rural digitalization identifies connectivity limitations and sociocultural barriers as major obstacles to the adoption of digital technologies, while institutional and economic factors can function as important drivers ([Rundel et al., 2022](#)). Digital transformation in rural contexts must therefore be understood as a socio-technical process rather than merely as technological modernization ([Rijswijk et al., 2021](#)). Without adequate digital literacy, organizational capabilities, and institutional support, technological investments may reproduce rather than reduce existing inequalities.

This problem is particularly relevant for Indonesian villages. Although digital platforms provide new opportunities for rural enterprises to access broader markets, many BUMDes continue to

experience structural and managerial barriers to digital integration. Recent studies indicate that digital transformation at the village level remains constrained by inadequate infrastructure, limited digital literacy, insufficient human resources, and uneven institutional capacity ([Anisariza et al., 2025](#)). Research on BUMDes governance similarly emphasizes the need to integrate human-resource management, financial governance, production, logistics, marketing, and technology when responding to the digital economy ([Tarlani et al., 2023](#)). Consequently, digital transformation should not be assessed solely in terms of technology adoption but also according to its capacity to improve organizational performance and create tangible socioeconomic benefits for rural communities.

Beyond conventional digitalization, the rapid development of artificial intelligence (AI) introduces a new technological dimension to rural economic transformation. AI enables organizations to process large volumes of data, automate routine activities, generate predictions, support decision-making, and personalize interactions with customers ([Duan et al., 2019](#)). Organizations that develop appropriate AI capabilities can improve organizational creativity and performance by combining technological resources, data, human expertise, and complementary organizational capabilities ([Mikalef & Gupta, 2021](#)). AI may therefore offer BUMDes opportunities to move beyond basic digital administration and marketing toward more data-driven and intelligent business processes.

From an organizational perspective, AI can create business value through automation, analytical insights, decision support, customer engagement, and operational optimization ([Enholm et al., 2022](#)). Practical applications may include demand forecasting, customer segmentation, automated customer services, inventory management, financial analysis, product recommendations, and digital marketing optimization. However, AI adoption should not be understood as a purely technological intervention. Effective implementation requires organizational readiness, appropriate skills, data availability, governance mechanisms, and alignment between technology and human capabilities ([Makarius et al., 2020](#)). Moreover, AI introduces ethical, institutional, and governance concerns that must be considered alongside its economic benefits ([Dwivedi et al., 2021](#)).

These concerns become particularly relevant when AI is introduced into rural organizations characterized by limited technological resources and heterogeneous levels of digital literacy. While AI has considerable potential to improve decision-making and operational performance ([Duan et al., 2019](#)), organizations frequently struggle to translate AI investments into measurable business value because technological resources must be complemented by human and organizational capabilities ([Mikalef & Gupta, 2021](#)). The literature therefore emphasizes that the benefits of AI depend on how technological, human, and organizational resources are orchestrated rather than on the availability of AI technology alone ([Enholm et al., 2022](#)). In rural contexts, this implies that AI implementation must be adapted to local capabilities, infrastructure, business characteristics, and community needs.

Digital technologies may also contribute to economic resilience by improving the ability of organizations and communities to anticipate, respond to, and recover from external disturbances. Resilience involves not only maintaining existing economic activities but also developing adaptive capabilities that enable economic actors to respond to uncertainty and exploit emerging opportunities ([Darnhofer, 2021](#)). Evidence from rural and agricultural contexts demonstrates that digital technologies can support resilience by strengthening information access, coordination, market connectivity, and adaptive decision-making ([Rijswijk et al., 2021](#)). Smart technologies can also assist rural economic actors in coping with major disruptions, although their effectiveness depends on institutional arrangements and equitable access to technological resources ([Klerkx & Rose, 2020](#)).

Recent empirical evidence further suggests a direct relationship between rural digital development and economic resilience. Digital infrastructure, technological innovation, and improved industrial coordination can strengthen the adaptive capacity of rural economies ([Li, 2026](#)). Similarly, AI-based analytical technologies have demonstrated potential to improve the resilience of production systems by enabling more accurate prediction and data-driven resource management ([Jung et al., 2021](#)). These findings provide a theoretical basis for considering digital transformation and AI not merely as instruments for increasing efficiency but also as capabilities for strengthening the resilience of rural economic systems.

Despite the growing literature, an important research gap remains. First, existing BUMDes digitalization studies predominantly focus on specific technological applications, such as digital

marketing ([Mudjiyanti et al., 2022](#)), management information systems ([Buchori et al., 2024](#)), digital accounting ([Fatimah et al., 2026](#)), integrated information systems ([Yunanto et al., 2026](#)), and digital branding and legal protection ([Anisariza et al., 2025](#)). Although these studies provide important insights into the benefits of digital technologies, they generally examine digitalization at the organizational or functional level rather than investigating how digital transformation contributes to the broader economic resilience of village communities.

Second, the emerging literature on AI has largely examined corporations, SMEs, public organizations, and technologically intensive sectors. Existing studies have established that AI capabilities can enhance organizational performance and decision-making ([Mikalef & Gupta, 2021](#)), generate multiple forms of business value ([Enholm et al., 2022](#)), and reshape human-technology interactions within organizations ([Makarius et al., 2020](#)). However, the application of these insights to Village-Owned Enterprises remains underexplored. In particular, limited empirical evidence explains how AI can be integrated into the digital transformation of BUMDes and how such integration can generate economic value that extends beyond organizational performance to the resilience of the surrounding rural community.

This gap is evident in the case of BUMDes Agung Manunggal in Kebonagung Village, Imogiri, Bantul, Special Region of Yogyakarta. The enterprise manages several local business units, including Desamart, Pasimas, culinary businesses, and a farming museum, thereby providing an important institutional platform for mobilizing the village's economic potential. Nevertheless, as a developing BUMDes, it continues to face challenges related to managerial capacity, service optimization, market reach, and the effective utilization of digital technologies. These conditions make BUMDes Agung Manunggal a relevant empirical setting for examining how digital transformation can evolve from basic technology adoption into a broader strategy for strengthening rural economic resilience.

Accordingly, this study addresses two interrelated research questions: (1) How does the digital transformation of BUMDes Agung Manunggal contribute to strengthening the economic resilience of the Kebonagung Village community? and (2) How can artificial intelligence be strategically integrated into BUMDes business processes to enhance organizational effectiveness, competitiveness, and rural economic resilience? Based on these questions, the study aims to analyze the contribution of BUMDes digital transformation to rural economic resilience and to identify the strategic opportunities, requirements, and potential applications of AI within BUMDes operations.

The novelty of this study lies in integrating digital transformation, artificial intelligence, BUMDes development, and rural economic resilience within a single analytical framework. Unlike previous studies that predominantly examine individual digital applications or the direct effects of technology on BUMDes performance, this study conceptualizes digital transformation as an organizational capability through which BUMDes can strengthen the adaptive and economic capacity of rural communities. Furthermore, it extends the emerging literature on AI capability into the context of village-owned enterprises by examining AI not as an isolated technology but as a strategic extension of BUMDes digital transformation. This perspective provides both theoretical and practical contributions by linking organizational-level technological transformation with community-level economic resilience.

The remainder of this paper is organized as follows. The next section reviews the theoretical foundations and relevant literature on digital transformation, BUMDes development, AI capabilities, and rural economic resilience. The subsequent section describes the research methodology and empirical setting of BUMDes Agung Manunggal. The results section presents the study findings, followed by a discussion that relates the empirical evidence to previous research and theoretical perspectives. Finally, the paper concludes by presenting the theoretical and managerial implications, research limitations, and recommendations for future research.

2) Literature Review and Hypothesis Development

2.1 Theoretical Foundation

The digital transformation of Village-Owned Enterprises (Badan Usaha Milik Desa [BUMDes]) represents an organizational adaptation to changes in technology, markets, consumer behavior, and the broader digital economy. Digital transformation extends beyond the conversion of conventional activities into digital formats. It involves fundamental changes in organizational processes,

capabilities, value creation, and interactions with stakeholders through the strategic use of digital technologies (Vial, 2019; Verhoef et al., 2021). In the context of BUMDes, this transformation may include digital financial management, integrated information systems, digital marketing, e-commerce, customer databases, online services, and increasingly, artificial intelligence (AI)-supported business processes. This study draws primarily on the Dynamic Capabilities View (DCV) to explain how BUMDes can develop organizational capabilities to respond to technological and environmental changes. Dynamic capabilities refer to an organization's ability to identify opportunities and threats, mobilize resources, and reconfigure existing capabilities in response to environmental changes (Teece, 2018). From this perspective, digital technologies themselves do not automatically generate superior organizational outcomes. Instead, value emerges when organizations develop the capability to integrate technological resources with human resources, managerial processes, organizational knowledge, and market opportunities. This theoretical perspective is particularly relevant to BUMDes because rural enterprises operate under resource constraints and rapidly changing market conditions. Digital transformation can enable BUMDes to sense new market opportunities, seize opportunities through digital channels, and transform conventional organizational processes. AI further strengthens these capabilities by enabling organizations to analyze information, automate activities, predict market conditions, and support managerial decision-making (Duan et al., 2019; Mikalef & Gupta, 2021).

The theoretical framework is complemented by the concept of economic resilience, which emphasizes the capacity of economic actors and communities to anticipate, absorb, adapt to, and recover from economic disruptions. Resilience does not merely refer to maintaining existing economic activities; it also encompasses the ability to reorganize resources, develop new capabilities, and exploit emerging opportunities following environmental changes (Darnhofer, 2021). Accordingly, this study conceptualizes BUMDes as an institutional mechanism through which digital capabilities can be transformed into organizational performance and, subsequently, stronger rural economic resilience.

2.2 Digital Transformation and BUMDes Performance

Digital transformation has become increasingly important for Village-Owned Enterprises because conventional administrative and business practices may limit organizational efficiency, transparency, market access, and competitiveness. Digital technologies provide BUMDes with opportunities to integrate financial management, marketing, customer services, inventory management, and business-unit information into more efficient organizational processes. Recent evidence demonstrates that digitalization can substantially improve BUMDes management. Erwin and Amri (2024) found that digital marketing communication, management information systems, digital literacy, and government support positively contribute to the economic performance and competitiveness of BUMDes. Their findings indicate that digital transformation is not merely an administrative innovation but an organizational capability capable of generating measurable economic outcomes.

Similarly, integrated information systems can reduce inefficiencies associated with manual business processes. Yunanto et al. (2026) identified manual financial management, fragmented operations, and limited marketing capabilities as important barriers to BUMDes performance. The implementation of an integrated information system provides a mechanism for coordinating marketing, financial, and multi-unit business activities. Digital platforms can therefore improve information accessibility, coordination, transparency, and organizational decision-making. Digital accounting provides another important dimension of BUMDes transformation. Fatimah et al. (2026) demonstrate that the transition from manual bookkeeping to digital accounting can strengthen accountability and managerial decision-making. However, their findings also show that digital adoption may remain partial when formal digital systems are inconsistent with the capabilities and working practices of BUMDes managers. This finding reinforces the argument that digital transformation requires complementary human and organizational capabilities. Furthermore, digital transformation can extend the geographical reach of village enterprises. Digital marketing, e-commerce, social media, and online platforms enable village products and services to reach customers beyond traditional local markets. Anisariza et al. (2025) emphasize that strengthening

BUMDes through digital transformation requires an integrated approach involving digital infrastructure, product digitalization, branding, digital literacy, economic empowerment, and stakeholder collaboration. These studies demonstrate that digital transformation can strengthen both the internal and external dimensions of BUMDes performance. Internally, digitalization can improve administrative efficiency, financial transparency, information management, and managerial decision-making. Externally, it can enhance customer engagement, market reach, product visibility, and competitiveness. However, previous research remains predominantly focused on individual digital applications, including digital marketing, accounting systems, web-based platforms, and information systems. Limited research has conceptualized these activities as an integrated organizational transformation capability, particularly within developing BUMDes. The present study therefore views digital transformation as a broader organizational capability that enables BUMDes to restructure business processes and generate greater economic value.

H1: Digital transformation has a positive effect on BUMDes performance.

2.3 Artificial Intelligence Capability and BUMDes Performance

Artificial intelligence represents an advanced stage of digital transformation because it enables organizations to move from conventional digitalization toward intelligent, predictive, and data-driven business processes. AI can support organizations by automating repetitive activities, identifying patterns in data, predicting market conditions, improving customer interactions, and assisting managerial decision-making ([Duan et al., 2019](#)). AI capability refers not merely to the possession or use of AI applications but to an organization's capacity to mobilize technological, human, and organizational resources to generate business value from AI. [Mikalef and Gupta \(2021\)](#) conceptualize AI capability as a multidimensional organizational capability involving tangible resources, human skills, and intangible organizational resources. Their empirical evidence demonstrates that stronger AI capability can enhance organizational creativity and firm performance. This distinction is particularly important for BUMDes. Simply providing access to generative AI, automated applications, or analytical platforms does not guarantee improvements in organizational performance. Managers must understand how these technologies can be integrated into existing business processes and aligned with local economic needs. For BUMDes, AI may have several practical applications. AI-supported demand forecasting can help managers estimate demand for village products and optimize inventory. AI-based financial analysis can assist managers in identifying revenue and expenditure patterns. Recommendation systems can support personalized product promotion, while generative AI can facilitate content creation for digital marketing. Chatbots can provide basic customer services, and AI-assisted analytical tools can improve the quality and speed of managerial decision-making.

Existing literature provides strong evidence regarding the organizational benefits of AI. [Enholm et al. \(2022\)](#) demonstrate that AI can create business value through improved decision-making, operational efficiency, automation, innovation, and customer engagement. [Makarius et al. \(2020\)](#), however, argue that successful AI integration requires alignment between technological systems and human capabilities. This suggests that AI should be treated as a socio-technical organizational capability rather than an isolated technological solution. The importance of this perspective is amplified in rural organizations where digital skills, infrastructure, financial resources, and data availability may be limited. Recent initiatives involving BUMDes have nevertheless begun to demonstrate the feasibility of AI utilization. AI education for BUMDes employees, for example, has been associated with improved understanding of prompt creation, information processing, administrative activities, and digital reporting. Such evidence suggests that AI can support productivity when implementation is accompanied by capacity development. Nevertheless, research on AI within BUMDes remains at an early stage. Most existing AI research examines large companies, SMEs, government organizations, or technologically advanced industries, while studies specifically examining AI capability in Village-Owned Enterprises remain scarce. This creates an important theoretical and empirical opportunity to extend the AI capability literature into rural economic institutions. Building on the Dynamic Capabilities View and previous evidence regarding AI capability

and organizational performance, this study argues that BUMDes capable of integrating AI into business processes will be better positioned to improve efficiency, market responsiveness, innovation, and decision quality.

H2: Artificial intelligence capability has a positive effect on BUMDes performance.

2.4 BUMDes Performance and Rural Economic Resilience

Rural economic resilience refers to the ability of rural economic systems and communities to maintain, adapt, and recover their economic activities when confronted with internal or external disruptions. Such disruptions may include economic downturns, changes in consumer demand, market competition, technological disruption, supply-chain problems, natural disasters, or other socioeconomic shocks. Within the village economic ecosystem, BUMDes can play an intermediary role between local resources and community economic outcomes. Strong BUMDes performance can generate village revenue, expand markets for local products, create employment opportunities, facilitate access to goods and services, and support the development of village-based entrepreneurial activities. Consequently, the performance of BUMDes should be evaluated not only from the perspective of organizational profitability but also according to its contribution to the economic capacity of the surrounding community. The resilience perspective provides an appropriate theoretical basis for understanding this relationship. [Darnhofer \(2021\)](#) argues that resilience involves adaptive capacity and the ability to reorganize economic activities under changing conditions. In rural economies, organizations that facilitate market connectivity, resource mobilization, information exchange, and economic diversification can increase the capacity of communities to respond to uncertainty.

Digital development can reinforce this mechanism. Recent empirical research indicates that the digital economy can significantly enhance rural economic resilience through digital platforms, innovation, and economic diversification. Evidence also suggests that these effects may extend beyond individual organizations by generating spatial and economic spillovers across rural areas. At the micro level, rural digital adoption has also been associated with stronger local economic capabilities. Capacity development involving managerial competence, financial literacy, product innovation, and digital marketing has been shown to improve the ability of rural economic actors to participate in digital markets and contribute to sustainable village economic development. In the BUMDes context, digital services can strengthen local economies by connecting institutional development with community empowerment. Recent evidence from BUMDes Kuala Dua demonstrates that digital service development can function as a strategy for enhancing the local economy and strengthening village-based digital economic institutions. Likewise, digitalization and institutional support have increasingly been associated with the sustainability of BUMDes as community empowerment mechanisms. These findings suggest an important causal mechanism. Digital transformation and AI may initially improve organizational processes within BUMDes; however, their broader socioeconomic value emerges when improved organizational performance generates benefits for the surrounding rural economy. Higher BUMDes performance may expand market access for local products, create economic opportunities, strengthen village revenue, improve services, and support the diversification of local economic activities. These outcomes ultimately enhance the community's capacity to withstand and adapt to economic changes. This relationship is particularly relevant to BUMDes Agung Manunggal because its business units—including Desamart, Pasimas, culinary businesses, and the farming museum—connect organizational activities directly with the local economic ecosystem of Kebonagung Village. Improving the performance of these business units therefore has the potential to produce economic benefits beyond the organizational boundaries of the BUMDes.

H3: BUMDes performance has a positive effect on rural economic resilience.

3) **Research Method**

3.1 Research Design

This study employed a qualitative approach using a case study design to obtain an in-depth understanding of digital transformation and the potential use of artificial intelligence (AI) in Village-Owned Enterprises (Badan Usaha Milik Desa [BUMDes]). A qualitative case study is appropriate when a study seeks to investigate a contemporary phenomenon within its real-life context and requires detailed information from multiple sources of evidence ([Creswell & Poth, 2018](#); [Yin, 2018](#)). This design was selected because the study focuses on understanding the processes, experiences, challenges, and perceived economic implications of digital transformation rather than statistically testing causal relationships. The study specifically examined BUMDes Agung Manunggal in Kebonagung Village, Imogiri District, Bantul Regency, Special Region of Yogyakarta, Indonesia. BUMDes Agung Manunggal was selected as the case because it manages several village-based business units and is currently developing its organizational and digital capabilities. The case therefore provides an appropriate empirical setting for examining how digital transformation is implemented in a developing Village-Owned Enterprise and how AI may potentially support organizational effectiveness and rural economic resilience.

The unit of analysis was BUMDes Agung Manunggal as an organizational entity, while the analysis also considered its relationships with village government officials, local communities, business users, and other relevant stakeholders. The study focused on four major issues: the current stage of BUMDes digitalization, the existing and potential utilization of AI, the contribution of digital transformation to rural economic resilience, and the challenges and strategies associated with future digital development.

3.2 Research Setting and Participants

The research was conducted in Kebonagung Village, Imogiri District, Bantul Regency, Special Region of Yogyakarta. Participants were selected purposively based on their knowledge, experience, and involvement in the management, implementation, or utilization of BUMDes services. Purposive sampling was used because qualitative case study research requires information-rich participants who can provide detailed explanations of the phenomenon being investigated. The primary informants consisted of BUMDes managers and village government officials who were directly involved in the management, supervision, or development of BUMDes Agung Manunggal. Additional informants included community members who had experience using BUMDes products or services and, where relevant, technology partners involved in supporting digital systems or technological development. Participant selection continued until the information collected was considered sufficiently comprehensive to explain the principal themes of the study and additional interviews no longer generated substantial new insights. This approach allowed the researchers to obtain perspectives from both institutional actors and community beneficiaries and facilitated comparison across different sources of information.

3.3 Data Collection Techniques and Research Instruments

Data were collected using multiple techniques, including in-depth interviews, direct observation, documentation, and Focus Group Discussions (FGDs). The use of multiple data sources was intended to provide a comprehensive understanding of the case and strengthen the credibility of the findings through methodological triangulation. In-depth semi-structured interviews served as the primary method of data collection. Interviews were conducted with BUMDes managers, village government officials, community members, and relevant technology partners. The interview guide contained open-ended questions concerning the current management of BUMDes, existing digital practices, experiences with digital technologies, perceived benefits and limitations of digitalization, opportunities for AI adoption, changes in service delivery and market access, and the perceived contribution of BUMDes activities to community economic resilience. Semi-structured interviews were used to ensure consistency across participants while allowing the researchers to explore emerging issues in greater depth. Direct observation was conducted at BUMDes Agung Manunggal and its relevant business units to identify how digital technologies were used in actual organizational practices. Observations focused on administrative processes, transaction activities, communication

with customers, digital marketing practices, information management, service processes, and technology-supported activities. Field notes were used to document relevant activities, interactions, and contextual conditions observed during the research process. Document analysis was conducted to complement and verify information obtained through interviews and observations. The documents examined included the BUMDes organizational profile, business-unit information, financial and transaction records where accessible, administrative documents, promotional materials, social media activities, and digital platforms or applications used by the organization. Only documents relevant to the objectives of the study and authorized for research purposes were included in the analysis.

FGDs were conducted with selected stakeholders, including BUMDes managers, village government representatives, community representatives, and other relevant actors. The FGDs were used to further discuss the primary issues identified during interviews, clarify differences in stakeholder perspectives, explore collaborative strategies for digital transformation, and validate preliminary interpretations concerning AI utilization and rural economic resilience. A supplementary questionnaire could be used only when necessary to obtain descriptive information from a broader group of community members regarding their experiences with BUMDes digital services. However, because this study adopted a qualitative case study design, questionnaire data were treated solely as supporting descriptive evidence rather than as the primary basis for statistical hypothesis testing.

Table 1. Data Sources and Research Instruments

Data Source	Participants/Materials	Main Information Explored	Instrument
In-depth interview	BUMDes managers	Digital transformation processes, managerial practices, technological adoption, AI opportunities, challenges, and organizational performance	Semi-structured interview guide
In-depth interview	Village government officials	Institutional support, policies, governance, village development, and BUMDes contribution to the local economy	Semi-structured interview guide
In-depth interview	Community members/users	Experience with BUMDes services, accessibility, economic benefits, market opportunities, and perceived economic resilience	Semi-structured interview guide
In-depth interview	Technology partners, where applicable	Digital infrastructure, technological readiness, AI implementation opportunities, and technical challenges	Semi-structured interview guide
Observation	BUMDes activities and business units	Digital business processes, transactions, customer services, digital marketing, information management, and technology use	Observation checklist and field notes
Documentation	Organizational and operational documents	Business profile, financial information, transactions, digital platforms, promotional activities, and supporting evidence	Document review sheet
Focus Group Discussion	Key stakeholders	Validation of findings, development priorities, AI opportunities, challenges, and collaborative strategies	

Source: Authors' own elaboration based on the research methodology (2026).

3.4 Research Procedure

The research procedure was conducted in several interconnected stages. The first stage involved preliminary identification of the research context through an assessment of BUMDes Agung Manunggal, its business units, organizational characteristics, and existing digital activities. This stage was used to define the boundaries of the case and identify relevant stakeholders.

The second stage involved the selection of informants and collection of primary data through semi-structured interviews and direct observation. Interviews were conducted individually to enable participants to describe their experiences and perceptions in detail. Where permission was granted, interviews were recorded to ensure accuracy during transcription. Field notes were prepared to document contextual information, observations, and relevant non-verbal information. The third stage involved collecting supporting documents and comparing documentary evidence with information obtained from interviews and observations. Preliminary findings were then organized into major categories and discussed through FGDs with selected stakeholders. The FGD process served both to enrich the findings and to clarify issues that required further interpretation. The final stage involved data coding, thematic analysis, triangulation, interpretation, and member checking. The entire process was conducted iteratively, meaning that data collection and preliminary analysis occurred concurrently. This enabled the researchers to identify emerging themes and obtain additional clarification when necessary.

3.5 Data Analysis

The qualitative data were analyzed using the interactive model of [Miles, Huberman, and Saldaña \(2014\)](#), consisting of data condensation, data display, and conclusion drawing and verification. Data analysis began after the initial data collection and continued throughout the research process. First, data condensation involved transcribing interview and FGD data, organizing field notes and documents, selecting information relevant to the research objectives, and coding meaningful statements. Information unrelated to the research questions was excluded, while significant statements were grouped into analytical categories. Second, data display involved organizing the coded information into descriptive matrices, thematic categories, and narrative explanations. This process facilitated comparisons across informants and data sources and helped identify similarities, differences, patterns, and relationships among the emerging findings. Third, conclusion drawing and verification involved interpreting the identified patterns and relating them to the research questions and theoretical framework. Initial interpretations were continuously compared with the original data to ensure that conclusions were supported by sufficient empirical evidence. The study also employed thematic analysis to identify recurring patterns across the qualitative dataset. The analysis was organized around four main themes: (1) stages and forms of digital transformation, (2) existing and potential applications of AI, (3) contributions to rural economic resilience, and (4) implementation barriers and development strategies. These initial themes served as analytical guidance rather than fixed categories; additional themes were allowed to emerge inductively from the empirical data.

3.6 Trustworthiness of the Data

The trustworthiness of the study was established through source triangulation, methodological triangulation, and member checking. Source triangulation was conducted by comparing information obtained from BUMDes managers, village government officials, community members, and other relevant stakeholders. Methodological triangulation was performed by comparing findings from interviews, observations, documentation, and FGDs. Member checking was conducted by presenting important interpretations or preliminary findings to selected key informants to determine whether the researchers' interpretations accurately reflected participants' experiences and perspectives. Where discrepancies were identified, the interpretations were reconsidered using the original interview records and supporting evidence. In addition, an audit trail was maintained by systematically documenting data collection procedures, interview records, observation notes, coding processes, documentary evidence, and analytical decisions. These procedures were intended to strengthen the credibility, dependability, confirmability, and transparency of the qualitative research process.

3.7 Ethical Considerations

Before data collection, participants were informed about the purpose of the research, the type of information requested, and their voluntary participation in the study. Participants were given the opportunity to decline participation or withdraw from the study. Interview and organizational information was used exclusively for research purposes, while confidential or sensitive information was anonymized where necessary. Recording, documentation, and the use of institutional data were conducted only after obtaining appropriate permission from the relevant participants or authorities.

4) Results and Discussion

a) Analysis Results

The findings were derived from in-depth interviews, observations, and supporting documentation concerning the digital transformation of BUMDes Agung Manunggal in Kebonagung Village, Imogiri, Bantul. Four key participants were involved in the interviews, representing the village government, BUMDes management, business-unit management, and relevant stakeholders. For analytical purposes, the participants were coded as P1 (Village Government Representative), P2 (BUMDes Director/Manager), P3 (BUMDes Business Unit Manager), and P4 (BUMDes Stakeholder). The analysis generated four major themes: (1) the gradual and partial digital transformation of BUMDes, (2) AI readiness and potential utilization, (3) the contribution of BUMDes to rural economic resilience, and (4) potentials and barriers to sustainable digital transformation.

Table 2. Summary of the Main Qualitative Findings

Theme	Key Findings	Empirical Indications
Digital transformation process	Digitalization has begun but remains partial and fragmented	Social media promotion, cashier application, QRIS, bank transfer, accounting templates, and SISKUDES-related reporting
AI readiness and potential use	AI has not yet been formally implemented, but management demonstrates awareness and willingness to adopt it	Potential use for content creation, customer service, business analysis, reporting, and operational support
Rural economic resilience	BUMDes provides essential services and is expected to become a local economic circulation hub	Desamart, waste management, PAMSIMAS, agricultural products, food security, local distribution
Human resource readiness	Human resources constitute the most significant barrier	Limited digital literacy, ageing management personnel, difficulty attracting younger workers
Institutional readiness	Organizational structure exists, but digital policies and integrated systems remain limited	No specific digital transformation policy; manual and digital procedures coexist
Infrastructure and technology	Basic infrastructure is available but not optimally utilized	Internet availability, inactive website, QRIS discontinuation in some activities, limited supporting equipment
Local economic potential	Strong potential for expanding village-based economic activities	Agriculture, livestock, fisheries, MSMEs, waste management, water services, food security
External challenges	Competition and market adaptation constrain business development	Modern retail competition, weak product branding, limited digital adoption among some residents

Source: Authors' own elaboration based on qualitative data analysis (2026).

The Digital Transformation Process of BUMDes Agung Manunggal

BUMDes Agung Manunggal was established in 2018 as a village economic institution intended to manage local economic potential and provide services to the community. Institutionally, the BUMDes has an organizational structure consisting of an advisor, director, supervisory board, secretary, treasurer, and heads of individual business units. At the operational level, each active business unit is managed by a unit head and supporting employees. The major active business units identified during the study were Desamart or the village store, PAMSIMAS or clean-water services, and waste-management services. At the time of the study, the BUMDes was also preparing to develop a food-security business unit intended to support the utilization and distribution of local agricultural and livestock products. The findings show that the digital transformation of BUMDes Agung Manunggal has developed gradually rather than through a formally designed digital transformation program. Digital tools have been introduced in several business and administrative activities, but their application remains fragmented across business units.

Financial and administrative activities were initially conducted manually using relatively simple Microsoft Excel files. Subsequently, accounting templates and government-supported financial reporting mechanisms began to be used. At the broader village-government level, financial information is also connected with the Sistem Keuangan Desa (SISKUDES). Nevertheless, the integration of financial information across BUMDes business units has not yet developed into a fully integrated digital financial-management system. Digitalization is more visible in promotional and transaction activities. The BUMDes has used social media platforms such as Facebook, Instagram, and TikTok to disseminate information and promote village products and services. However, interview evidence indicates that these platforms have not been systematically managed as an integrated digital-marketing strategy. Digital promotion remains dependent on the initiative and technological capabilities of individual managers.

One participant explained that the BUMDes had not received a specific institutional mandate requiring the adoption of digital technologies. Nevertheless, management acknowledged that digital technology had become increasingly important:

“There is no specific policy requiring us to use digital technology. However, under the current conditions, we realize that technology is something that needs to be utilized as effectively as possible.” (P2)

This statement indicates that digital transformation is currently driven primarily by internal awareness and practical necessity rather than by a formal digital-transformation policy.

At the operational level, Desamart represents the business unit with the most visible adoption of digital tools. A cashier application has been used to record transactions, while QRIS and bank transfers have been introduced as alternatives to cash payments. However, QRIS implementation has not always been sustainable because operational and technical difficulties were reported, particularly concerning the withdrawal or settlement of funds. Digital payment systems have also not been consistently extended to all BUMDes business units.

Digital promotion has followed a similar pattern. Social media has been adopted, but the lack of dedicated personnel responsible for digital marketing limits the continuity and quality of promotional activities. The BUMDes website had previously been available, but at the time of the research it was no longer actively maintained and was difficult for BUMDes administrators to update independently.

BUMDes management nevertheless considered digital promotion particularly important for expanding market access:

“For activities related to promotion, reporting, and perhaps accounting, technology can be useful. But for us, the most urgent need at the moment is promotion.” (P2)

The findings therefore suggest that BUMDes Agung Manunggal is not yet experiencing a complete organizational digital transformation. Instead, it is currently situated in an early or transitional stage of digitalization, characterized by the selective adoption of individual digital tools for transactions, administration, and promotion.

The transformation process can be summarized into three observable stages. First, basic digitization occurred when manual administrative records were transferred to Excel-based or application-supported processes. Second, functional digitalization emerged through the adoption of social media, cashier applications, QRIS, bank transfers, and government financial systems. Third, an integrated transformation stage is anticipated but has not yet been achieved, as the existing digital tools remain fragmented and are not supported by a comprehensive organizational digital strategy.

AI Readiness and Potential Utilization in BUMDes

A second major finding concerns artificial intelligence. The evidence shows that AI has not yet been institutionally implemented in BUMDes Agung Manunggal. Participants had varying levels of familiarity with AI applications, with some reporting personal experience using AI-based tools, but there was no dedicated AI system, formal AI policy, AI-based business process, or organizational AI implementation at the time of the research.

Despite this limited adoption, BUMDes managers demonstrated a positive attitude toward future AI utilization. AI was perceived as potentially relevant for marketing, reporting, customer communication, business analysis, and content production. One participant stated:

“I have used it a little personally. If it can be used and implemented by an institution such as BUMDes, I think it can be very useful, but it must be used appropriately.” (P2)

This finding demonstrates a distinction between current AI adoption and organizational AI readiness. The BUMDes has not yet reached the implementation stage, but management has begun to recognize the potential business value of AI.

Several potential AI applications emerged from the interviews. The first and most frequently discussed application was digital marketing and content production. Participants perceived generative AI as useful for producing promotional text, images, posters, product descriptions, and other social-media content. Such applications were considered particularly relevant because promotion was identified as one of the BUMDes' most urgent organizational needs.

A participant explained:

“It could be used for marketing—creating better wording, better images, and better reports. For BUMDes Agung Manunggal, it could be particularly useful for the waste unit, the store, and later the new food-security unit.” (P2)

The second potential application involves AI-supported customer service. Participants suggested that chatbot technology could help BUMDes respond more quickly to customer questions and complaints. The technology could initially categorize common questions or complaints and redirect more complex issues to human operators.

As one stakeholder explained:

“AI could make responses to complaints faster. For example, if there were a chatbot, common complaints could be answered automatically, while more specific problems could be directed to the operator. AI could also help classify the problems so that improvements could be made more easily.” (P4)

The third potential application concerns business and customer-data analysis. AI was considered capable of supporting the analysis of sales patterns, customer preferences, product demand, and financial information. Such analysis could potentially enable BUMDes managers to make more evidence-based decisions concerning inventory, promotion, product development, and market expansion.

The fourth potential application relates to operational optimization. In the waste-management unit, for example, AI-supported data analysis could eventually be used to estimate waste volume, identify service patterns, or support more efficient collection routes. In the planned food-security unit, AI could potentially support market information, demand forecasting, marketing content, and information related to local agricultural commodities.

However, these possibilities should be interpreted as potential use cases identified by participants rather than technologies that are already operating in the BUMDes.

The main obstacle to AI adoption was identified as human-resource capability. Several managers and operational staff were reported to be above 40 years of age and less accustomed to rapidly changing digital applications. Younger personnel were generally considered more adaptive to new technology. As a result, the Desamart unit, which involves relatively younger personnel, was perceived as more technologically ready than some other units.

One participant emphasized:

“We hope that in the future every business unit can have at least one younger person so that technology can really be used. In some units, most of the personnel are still over 40. Human resources are therefore very important if we want digital technology to be used better.” (P2)

Importantly, internet availability was not identified as the principal barrier. Although supporting infrastructure still requires improvement, participants consistently emphasized that the absence of sufficiently skilled and motivated human resources represented the more fundamental constraint.

“For Kebonagung at the moment, the biggest issue is human resources. In terms of network and costs, I do not think they are as critical. The main problem is our limited human-resource capacity.” (P2)

Therefore, the central finding concerning AI is not that BUMDes Agung Manunggal has already transformed its operations through artificial intelligence. Rather, the organization exhibits an emerging AI readiness characterized by management interest and identifiable use cases but constrained by limited digital skills, dedicated personnel, organizational systems, and implementation capacity.

Contribution of BUMDes to Rural Economic Resilience

The third theme concerns the relationship between BUMDes activities and the economic resilience of the Kebonagung Village community. The findings indicate that the present contribution of BUMDes to economic resilience is generated primarily through essential service provision, local economic circulation, access to basic goods, and the future potential to coordinate local production

and distribution. BUMDes Agung Manunggal operates business units that are directly linked to community needs. Desamart provides daily necessities, the waste-management unit provides environmental services, and PAMSIMAS provides access to clean water. Although these activities do not necessarily generate high commercial returns, they create social and economic value by maintaining access to essential services within the village.

The participants also described the BUMDes as an institution expected to connect local production with local consumption. The original vision was not limited to operating individual business units but included establishing BUMDes as a mechanism for collecting, distributing, and marketing products produced by residents.

One participant described this vision as follows:

“From the beginning, we expected BUMDes to become a place for the distribution and circulation of products produced by Kebonagung residents, whether agricultural products, MSME products, or fisheries. BUMDes could accommodate these products and become their marketer.” (P2)

Agriculture emerged as a particularly important component of this vision. Kebonagung possesses agricultural, livestock, fisheries, and MSME potential. The future food-security business unit is expected to provide a stronger mechanism for linking these local economic resources to BUMDes.

Participants envisioned a local economic cycle in which farmers could sell rice or other commodities to BUMDes, BUMDes could market these products, and residents could purchase both food and agricultural inputs through BUMDes.

“If BUMDes can accommodate the products, people can continuously sell to BUMDes, and those products can return to the community. The circulation of local food products could therefore remain within the village economy.” (P2)

Another statement emphasized the expected continuity of this system:

“We hope that food security in Kebonagung can become sustainable. Farmers could sell rice or paddy to BUMDes, and they could also buy their agricultural needs, such as fertilizer, through BUMDes. If circulation, distribution, and community needs can be optimized through BUMDes, sustainable food security can be strengthened.” (P2)

These statements reveal that economic resilience in this case is closely associated with local economic circulation. A stronger BUMDes is expected to reduce dependence on external intermediaries, facilitate market access for producers, and retain a greater proportion of economic value within the village.

Digital technology is perceived as potentially strengthening this mechanism. Expanding online promotion, digital transactions, and digital customer communication could enable village products to reach markets beyond Kebonagung. Participants expected that a wider market could increase sales and, ultimately, BUMDes revenue.

One participant noted:

“Digital technology can expand the market and make activities more efficient, and hopefully it can also increase BUMDes revenue.” (P4)

AI was also associated with this economic potential, especially where it could connect customer demand with BUMDes products or facilitate faster customer responses. Nevertheless, the findings show that such economic impacts remain primarily prospective because AI-based processes have not yet been formally implemented.

The current contribution of BUMDes to rural economic resilience should therefore be interpreted at two levels. The first is the existing resilience function, derived from the provision of clean water, waste management, daily necessities, and other local services. The second is the developmental resilience potential, which depends on the future ability of BUMDes to integrate local agricultural production, MSMEs, food security, broader markets, and digital technologies.

Local Potentials and Challenges of Digital Transformation

The fourth theme identifies the resources that could support the future transformation of BUMDes as well as the barriers that could constrain it.

The first major strength is local economic potential. Participants described Kebonagung as having considerable resources in agriculture, livestock, fisheries, food production, and human resources. These assets provide opportunities for the development of BUMDes beyond its existing business units.

One participant explained:

"Kebonagung actually has considerable potential for building resilience. Agriculture is strong, livestock and fisheries are also available, and there are also human resources. The problem is that relatively few people are currently willing to become directly involved in BUMDes." (P2)

The second strength is the existence of established service-based business units. The waste-management unit has developed a relatively stable customer base, while PAMSIMAS provides an essential public service. Desamart also provides an existing distribution channel that could potentially be expanded to accommodate products from local producers and MSMEs.

The third opportunity is institutional and external support. Village-government support, village funding mechanisms, government financial systems, universities, local governments, and potential corporate social responsibility programs can provide opportunities for training, technology transfer, institutional strengthening, and access to resources.

However, the findings reveal several substantial constraints.

The most consistently reported challenge is human-resource capacity. Digital literacy remains uneven, and management personnel are not uniformly comfortable with newer technologies. Limited financial incentives also make it difficult to attract and retain younger individuals with stronger digital capabilities.

This challenge has created a regeneration problem. Although Kebonagung has younger residents who may possess relevant technological skills, their participation in BUMDes management remains limited. Consequently, the organization faces a mismatch between its ambition to transform digitally and the availability of personnel capable of managing the transformation.

The second challenge is institutional and managerial integration. Although the organizational structure is established, several operational processes remain manual. The coexistence of manual records, separate applications, social media platforms, payment systems, and government reporting systems indicates that digitalization has not yet produced an integrated information architecture.

The absence of an active and independently manageable website further illustrates this fragmentation. Similarly, digital marketing activities are performed without a dedicated strategy, calendar, responsible team, performance indicators, or systematic customer-data management.

The third challenge concerns financial sustainability. According to information obtained during the study, the commercial performance of some units, particularly Desamart, remains relatively limited. Low turnover and narrow profit margins reduce the resources available for staff compensation, technological investment, marketing, and business expansion. This creates a circular constraint: stronger digital capabilities require investment, but weak business performance limits the resources available for that investment. The fourth challenge is infrastructure and operational reliability. While internet access is generally available, the quality of supporting digital infrastructure and equipment has not always been sufficient to support consistent digital operations. The discontinuation of QRIS use in certain activities because of technical difficulties illustrates that digital adoption requires not only initial deployment but also reliable maintenance and operational support. The fifth challenge is external competition. Desamart operates in an environment in which modern retailers and other commercial outlets provide strong competition. Local MSME products also face disadvantages in branding, packaging, and digital promotion compared with more established products.

Finally, community adoption remains heterogeneous. Some residents continue to prefer cash transactions and conventional modes of interaction. Consequently, rapid migration toward fully digital services could exclude segments of the community. The transformation process therefore needs to balance technological efficiency with accessibility and local user readiness. Taken together, these findings demonstrate that BUMDes Agung Manunggal possesses meaningful economic and institutional potential but has not yet developed the human, technological, and organizational capabilities required for comprehensive digital transformation.

b) Discussion

Digital Transformation as a Gradual Organizational Process

The first important finding is that digital transformation within BUMDes Agung Manunggal remains at an **early and fragmented stage**. The organization has adopted several digital technologies—social media, digital payment mechanisms, cashier applications, spreadsheet-based financial administration, and government financial systems—but these technologies have not yet been integrated into a coherent digital business model. This finding is important because the existence of digital tools should not automatically be interpreted as evidence of organizational digital transformation. Vial (2019) conceptualizes digital transformation as a process in which digital technologies trigger significant changes in organizational value creation, structures, and organizational responses. Similarly, Verhoef et al. (2021) distinguish between digitization, digitalization, and broader digital transformation. From this perspective, BUMDes Agung Manunggal is moving beyond purely manual operations but has not yet reached a stage in which digital technology systematically reshapes its overall organizational model. The finding corresponds closely with recent evidence concerning Village-Owned Enterprises in Indonesia. Pratistha et al. (2025) found that the digitalization of Village-Owned Enterprises remains largely limited to basic internet usage and simple applications that are not fully integrated into overall business processes. This similarity suggests that the experience of BUMDes Agung Manunggal is not an isolated organizational problem but reflects a broader challenge in the digital transformation of Indonesian village enterprises.

The present findings extend this literature by identifying the **sequence and internal mechanism** of digital transformation. Digital adoption in Agung Manunggal appears to proceed from basic administrative digitization toward functional digitalization before potentially reaching integrated transformation. Excel and accounting templates represent the first stage; social media, QRIS, cashier

applications, and other operational applications represent the second; while integrated data, digital customer management, analytics, and AI would represent a more advanced stage.

Digital financial transformation provides a clear example. Previous research indicates that financial applications in BUMDes can improve the efficiency of financial-data processing, reporting accuracy, and access to financial information. However, the Agung Manunggal case demonstrates that acquiring or accessing digital applications is insufficient when individual systems are not integrated and personnel do not possess comparable digital capabilities.

Therefore, the critical challenge is not **whether BUMDes uses technology**, but whether the organization possesses the capacity to integrate technology into routine organizational processes. This distinction is theoretically important because it shifts the analysis from technology adoption toward **organizational capability development**.

Human Resources as the Central Capability Gap

A particularly strong finding is that participants identified **human resources rather than internet infrastructure as the primary constraint** on digital transformation. This differs from the common assumption that the rural digital divide is caused primarily by connectivity.

Internet connectivity remains relevant, but in Kebonagung the availability of infrastructure has progressed faster than the organization's capacity to exploit it. Managers recognized the usefulness of digital technology but lacked dedicated personnel with the technical competencies, time, and incentives required to systematically manage social media, financial applications, websites, data, and new technological tools.

This finding can be interpreted through a capability perspective. Technology creates value only when it is combined with complementary resources such as knowledge, skills, organizational coordination, and managerial commitment. The inability to attract younger digitally capable personnel therefore creates a **capability bottleneck**.

Recent research on BUMDes digital transformation similarly emphasizes that successful digitalization requires more than infrastructure. Anisariza et al. (2025), for example, identify digital literacy, economic empowerment, institutional capacity, infrastructure, and stakeholder collaboration as interconnected components of an effective BUMDes digital transformation model.

Likewise, research on institutional transformation toward digitalization demonstrates that BUMDes development requires simultaneous improvements in organizational capacity rather than isolated technology deployment.

The generational pattern observed in Kebonagung should nevertheless be interpreted cautiously. The finding does not imply that older personnel are inherently incapable of using digital technologies. Instead, the interviews suggest differences in exposure, experience, and familiarity with newer digital tools. Therefore, the managerial implication is not simply to replace existing managers with younger employees, but to establish **intergenerational capability transfer**, training, mentoring, and clearer digital roles.

A practical strategy would be to place at least one digitally capable staff member within each business unit while simultaneously improving the digital capabilities of existing personnel. Such an approach would preserve accumulated institutional knowledge while accelerating technological adaptation.

AI as an Emerging Capability Rather Than an Existing Technology

The second central contribution of this study concerns the role of artificial intelligence. The findings demonstrate that AI adoption in BUMDes Agung Manunggal is still **prospective rather than operational**. This distinction is essential.

Management expressed considerable interest in AI and could identify relevant applications, including digital content creation, customer-service chatbots, sales analysis, financial reporting, product promotion, and operational optimization. However, no evidence was found of a formal organizational AI system currently integrated into BUMDes processes.

Thus, the appropriate analytical concept is **AI readiness** or **emerging AI capability**, rather than AI implementation.

This interpretation is consistent with Mikalef and Gupta (2021), who argue that organizational AI capability involves more than possessing an AI application. AI capability requires the combination of technological resources, data, technical and business skills, coordination mechanisms, and organizational change capacity. Their empirical findings demonstrate that such capabilities can contribute to organizational creativity and performance.

The Kebonagung findings illustrate the practical significance of this argument. BUMDes managers can access generative AI applications, but occasional individual use cannot yet be classified as an organizational AI capability. The organization currently lacks systematically managed data, dedicated AI-skilled personnel, formal procedures, and integration between AI and core business activities.

Consequently, an immediate investment in sophisticated AI systems would probably be premature. A more appropriate development sequence would be:

basic digitalization → integrated digital information → structured data → human-resource development → simple AI applications → advanced AI-supported decision-making.

This sequence is especially important because AI applications depend on the availability and quality of data. For example, demand forecasting is unlikely to produce meaningful results if sales records are incomplete, inconsistent, or dispersed across separate systems. Similarly, AI-supported customer analysis requires structured customer or transactional information.

The most feasible initial AI applications for Agung Manunggal are therefore **low-complexity, high-immediacy applications**, particularly generative AI for digital promotion, drafting promotional materials, preparing product descriptions, supporting administrative documents, and assisting with customer communication.

More advanced applications—such as predictive demand analysis, automated inventory optimization, financial anomaly analysis, waste-volume prediction, or route optimization—should follow only after the BUMDes develops a stronger digital-data foundation.

This finding provides a useful extension to the AI capability literature by demonstrating that, in resource-constrained village enterprises, AI capability develops through **incremental organizational readiness**, rather than through immediate large-scale technological adoption.

BUMDes as an Institutional Platform for Rural Economic Resilience

The third important finding is that the contribution of BUMDes to rural economic resilience cannot be evaluated solely through profit or turnover. BUMDes Agung Manunggal contributes to community resilience by maintaining **access to essential goods and services**, including daily necessities, clean water, and waste management.

This represents an important feature distinguishing Village-Owned Enterprises from conventional private enterprises. BUMDes simultaneously performs commercial and social-economic functions. Consequently, a business unit may produce relatively modest financial returns but still generate substantial community value.

The provision of clean water through PAMSIMAS, for example, supports the continuity of household activities. Waste-management services contribute to environmental quality and household services, while Desamart provides access to daily necessities. These functions create **service resilience** even before broader commercial impacts are realized.

The findings also reveal a more ambitious economic-resilience mechanism: BUMDes is expected to become a **local economic circulation hub**.

This mechanism can be represented as:

Local Production → BUMDes Aggregation → Marketing and Distribution → Local Consumption/External Market → Income Returned to the Village Economy.

Under this model, farmers and MSMEs sell their products through BUMDes, BUMDes facilitates processing or marketing, and consumers purchase local products through the same institutional ecosystem. Economic value therefore circulates within the village for longer rather than immediately leaking to external intermediaries.

This mechanism is particularly relevant to agricultural commodities. Participants' expectation that farmers could sell rice or other products to BUMDes while simultaneously purchasing agricultural inputs through the BUMDes illustrates a potentially **circular local economic model**.

The planned food-security unit could strengthen this role by connecting agricultural production, livestock, fisheries, distribution, and consumer markets. Digital technology could subsequently expand this local economic cycle beyond village boundaries by connecting products to regional or online markets.

Recent research supports the connection between digitalization, circular economic activities, community empowerment, and the sustainability of BUMDes. Research from Bangka Belitung, for example, explicitly examines digitalization and circular economy mechanisms as important dimensions of BUMDes sustainability.

However, the present study adds an important nuance: **economic resilience should not be claimed as a direct result of AI at this stage**. The current evidence supports a more cautious causal interpretation:

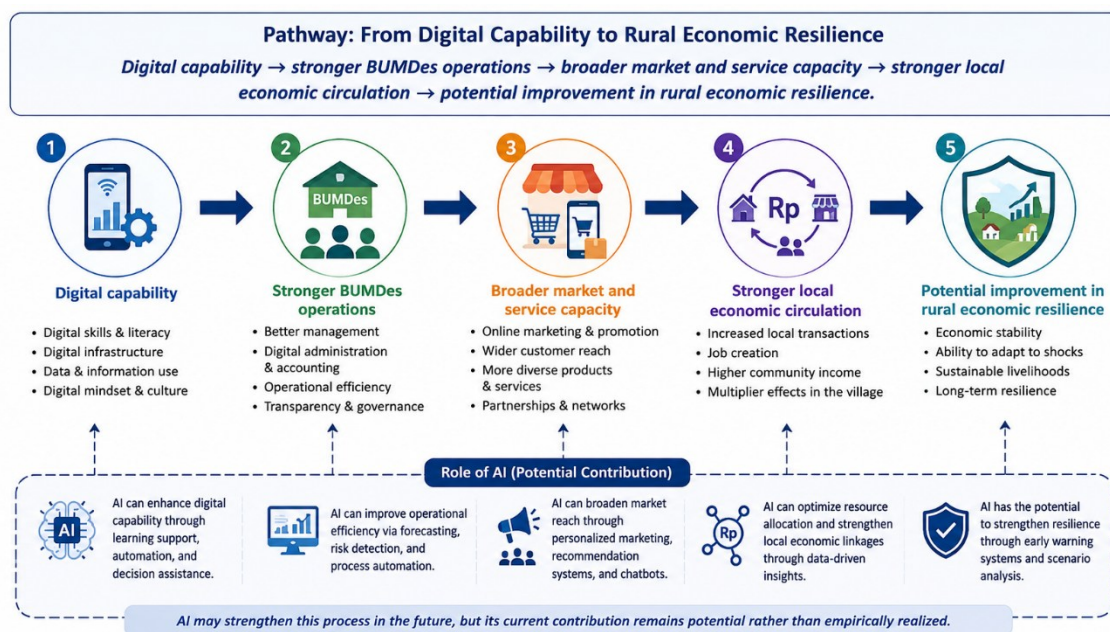


Figure 1. Digital Capability and AI-Enabled Pathway toward Rural Economic Resilience

Source: Authors' elaboration based on the study findings (2026).

From Digital Promotion to Market Expansion

Another prominent finding is the importance management assigns to digital promotion. This priority is understandable because several BUMDes businesses depend on local market demand while facing growing competition from modern retailers and more professionally branded products.

Social media currently provides BUMDes with an inexpensive mechanism for communicating with consumers, but its utilization remains largely tactical. Posting on Facebook, Instagram, or TikTok does not automatically constitute an effective digital-marketing strategy. Sustainable market expansion requires consistent branding, content planning, customer segmentation, product information, performance monitoring, and integration between promotional activities and sales channels.

This is precisely where AI may provide an achievable short-term contribution. Generative AI can reduce the resources required to prepare promotional text, content ideas, simple product descriptions, images, and customer-response templates. For a resource-constrained organization, such applications may increase communication productivity without requiring a sophisticated technological infrastructure.

Nevertheless, AI-generated promotion should continue to be supervised by human managers. Village products are embedded within local cultural, economic, and social contexts, and automated content may fail to accurately represent these characteristics without human review.

Thus, the most appropriate model is not the replacement of human personnel by AI, but **human-AI complementarity**, in which AI assists staff in repetitive and analytical tasks while managers retain responsibility for judgment, authenticity, local knowledge, and strategic decisions.

The Digital Transformation Paradox: Potential Without Organizational Readiness

The results reveal what can be described as a digital transformation paradox within BUMDes Agung Manunggal.

On one hand, the organization possesses many of the conditions required for future growth: village-government support, internet access, established business units, agricultural resources, local demand, potential young human resources, and management awareness of digital technology.

5) **Concluding Remarks and Recommendation**

This study examined the early-stage digital transformation of BUMDes Agung Manunggal in Kebonagung Village and its potential contribution to strengthening rural economic resilience, with particular attention to the prospective role of artificial intelligence (AI). Using a qualitative case study approach, data were obtained through in-depth interviews, observation, documentation, and stakeholder discussions. The findings indicate that BUMDes Agung Manunggal has begun adopting digital technologies through social media, cashier applications, digital payments, spreadsheet-based administration, and village financial systems. However, these initiatives remain partial, fragmented, and have not yet developed into an integrated digital transformation strategy. AI has also not been formally implemented, although management recognizes its potential for digital promotion, customer service, business-data analysis, reporting, and operational support. The findings further show that BUMDes contributes to rural economic resilience through essential services, local economic circulation, and the potential integration of agricultural products, MSMEs, food security, and village-based distribution.

The study provides theoretical, practical, and policy contributions. Theoretically, it demonstrates that digital transformation in Village-Owned Enterprises should be understood as a gradual capability-building process rather than merely the adoption of individual technologies. The findings also extend the discussion of AI into the context of rural economic institutions by showing that AI readiness depends on prior development of human-resource capabilities, organizational integration, structured data, and digital infrastructure. Practically, the study identifies human-resource capability as the most critical factor for accelerating digital transformation. BUMDes should therefore prioritize digital-literacy development, involve younger and digitally capable personnel, integrate existing digital systems, strengthen digital marketing, and introduce AI gradually through relatively simple applications with immediate organizational benefits. From a policy perspective, village governments and related institutions should provide clearer digital-transformation policies, capacity-building programs, technological assistance, and collaborative mechanisms involving universities, local governments, technology partners, and the private sector.

The originality of this study lies in linking digital transformation, emerging AI readiness, BUMDes institutional capability, and rural economic resilience within a single village-level case. Rather than assuming that AI directly improves village economic resilience, the findings suggest a sequential process in which human and institutional readiness enables digital integration, digital integration creates the foundation for selective AI adoption, and stronger organizational capability subsequently supports market expansion, local economic circulation, and community resilience. This perspective offers a more realistic pathway for AI-enabled transformation in resource-constrained rural enterprises.

This study is subject to several limitations. First, the research focuses on a single BUMDes, which limits the transferability of the findings to Village-Owned Enterprises with different institutional, economic, technological, and geographical characteristics. Second, the number of key informants was relatively limited and the findings primarily reflect stakeholder perceptions and current organizational practices. Third, AI adoption was still at an emerging or readiness stage; therefore, the study could not evaluate the actual economic effects of AI implementation. Future studies should involve multiple BUMDes across different regions, include broader stakeholder groups, and conduct longitudinal research to examine how digital transformation evolves over time.

Future research should also investigate the actual implementation of AI in specific BUMDes functions, including digital marketing, customer-service automation, demand forecasting, financial analysis, inventory management, and waste-management optimization. Comparative or mixed-method studies may also examine whether differences in digital literacy, organizational readiness, management quality, external support, and AI capability influence BUMDes performance and rural economic resilience. For BUMDes Agung Manunggal, the recommended development pathway is to strengthen human resources and formal digital policies, consolidate existing digital systems, improve infrastructure and data management, expand external collaboration, and subsequently introduce AI applications in stages according to organizational readiness and community needs.

Statement of Use of Generative AI

During the preparation of this work, the author used ChatGPT to assist in improving clarity and readability of the text. The author reviewed and edited the output and takes full responsibility for the content of the publication.

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Kalau editor sangat ketat dengan 7 tahun terakhir, sebaiknya referensi berikut tidak mendominasi. Namun secara substansi ketiganya sangat kuat dan masih layak dipertahankan sebagai foundational/seminal references:
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