

DOWNSTREAM DEVELOPMENT OF RURAL-OWNED ENTERPRISES (BUMDes) THROUGH DIGITAL FINANCIAL TECHNOLOGY TO ENHANCE RURAL ECONOMIC PERFORMANCE

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Abstract: This research aims to analyze the downstream development of Rural-Owned Enterprises (BUMDes) through the utilization of digital financial technology to improve rural economic performance in Pangkep Regency. BUMDes are rural economic institutions that play a strategic role in managing local potential, strengthening rural economic self-reliance, and improving community welfare. However, the management of BUMDes still faces various challenges, such as limited managerial capacity, low transparency in financial management, and limited access to modern financial systems. Therefore, the application of digital financial technology is viewed as a strategic innovation to improve business management efficiency, expand market access, and strengthen the governance of rural economic institutions. This research uses a mixed methods approach with a sequential explanatory design, which combines quantitative and qualitative methods in sequence. The first phase involved a survey of BUMDes managers, rural officials, and local business operators in Pangkajene and Kepulauan Regency, South Sulawesi, Indonesia, using a structured questionnaire to measure variables related to the adoption of digital financial technology, business management capacity, business innovation, and rural economic performance. Quantitative data were analyzed using descriptive statistics and regression analysis to determine the relationships among variables. The second stage involved in-depth interviews and focus group discussions (FGDs) with BUMDes managers and rural stakeholders to deepen understanding of the enabling factors and constraints in the implementation of digital financial technology. The research findings indicate that the adoption of digital financial technology and the downstream development of BUMDes businesses have a significant and positive impact on rural economic performance, particularly in enhancing financial transparency, operational efficiency, and expanding the marketing network for rural products managed by BUMDes. Qualitative findings also reveal that the success of BUMDes digitalization is heavily influenced by human resource capacity, support from rural government policies, and the availability of digital infrastructure. Thus, the development of BUMDes downstreaming based on digital financial technology can serve as an innovative strategy to strengthen rural economic performance and promote sustainable rural economic development.

Keywords: BUMDes, digital financial technology, rural business development, rural economy, institutional innovation

1. Introduction

Rural economic development is a key priority in efforts to improve community well-being and reduce the development gap between urban and rural areas. Rurals possess natural resources, human resources, and local economic potential that can be developed to drive sustainable economic growth [1], [2], [3]. In this context, the existence of Rural-Owned Enterprises (BUMDes) serves as a strategic instrument in strengthening rural economic self-reliance through the management of businesses based on local potential and community empowerment.

The establishment of BUMDes in Indonesia is part of rural development policy aimed at enhancing community economic capacity through the management of collective enterprises run jointly by rural governments and the community [4], [5], [6]. BUMDes are expected to serve as the driving force of the rural economy by managing various productive business units, such as trade, services, rural tourism, and the management of local resources. However, in practice, many BUMDes still face various challenges, including limited management capacity, low business innovation, a lack of transparency in financial management, and limited access to markets and formal financial institutions.

Conceptually, BUMDes are expected to serve as the driving force behind the rural economy through the management of various productive business units based on the potential and needs of the local community. These business units may include the trade sector, services, rural tourism, natural resource management, and other economic services that support the economic activities of the rural community. If managed effectively, BUMDes can provide significant economic value added for the rural community and encourage the creation of a more inclusive and sustainable local economic system. Furthermore, the success of BUMDes depends heavily on synergy between the rural government, the community, and various other stakeholders in developing institutional capacity and rural business networks [7], [8].

Although they hold great potential for driving rural economic growth, the implementation of BUMDes management in various regions still faces a range of structural and institutional challenges. One of the main issues frequently encountered is the limited managerial capacity and human resource competencies required to manage business units professionally. Many BUMDes managers come from the rural community and are highly committed to rural development, yet they lack sufficient experience and knowledge in business management, accounting, and modern business operations. This situation often results in suboptimal management of rural enterprises, leading to poor organizational performance and the unsustainability of BUMDes operations [9], [10].

In addition to limitations in human resource capacity, another challenge frequently faced by BUMDes is low transparency and accountability in financial management, as well as weak internal oversight systems. Several studies indicate that many BUMDes lack adequate financial recording systems, resulting in financial reports that do not fully meet accounting standards and are difficult to use as a basis for managerial decision-making. Limitations in oversight systems and low transparency can also reduce public trust in BUMDes management [11], [12].

On the other hand, limited access to markets, business capital, and economic infrastructure also hinder the development of BUMDes in various rural areas. Many BUMDes still face difficulties in developing product marketing networks and competing with larger businesses, particularly in areas with limited access to transportation and digital infrastructure. These conditions have prevented many BUMDes business units from developing optimally and sustainably. Therefore, innovative strategies for rural business development are needed to strengthen institutional capacity, improve market access, and drive rural economic transformation more effectively [13], [14].

With the development of the digital economy, the use of financial technology (fintech) has become one of the innovations that can drive improvements in the performance of rural economic institutions. Digital financial technology enables faster, more transparent, and more efficient financial transactions while also expanding access to financial services for rural communities [15]. The integration of digital technology into the management of Rural-Owned Enterprises (BUMDes) can support a more accountable financial recording system, expand the marketing network for rural products through digital platforms, and enhance financial inclusion for business actors at the rural level [16].

In the context of rural economic development, the concept of downstreaming is increasingly viewed as a key strategy for increasing the value added from local economic potential. Downstreaming is essentially the process of developing economic activities from the raw material production stage toward the processing of higher-value-added products, thereby increasing community income and strengthening the local economic structure [17], [18]. In Indonesia's rural development policies, the downstreaming approach is also aimed at optimally utilizing the potential of rural resources through the development of productive enterprises based on local potential. This strategy not only

enhances the competitiveness of rural products but also creates new business opportunities and expands employment opportunities for rural communities [19].

Furthermore, downstreaming in rural economic development is not limited to the process of transforming resources into products with higher economic value but also encompasses the strengthening of value chains involving various economic actors at the local level. This strengthening of value chains includes the processes of production, processing, distribution, and marketing of products in a sustainable and integrated manner. The development of rural economic value chains can drive increased business productivity, expand market access, and enhance the competitiveness of local products at both the regional and national levels. This approach also enables rurals to develop economic models based on local potential that are oriented toward sustainable economic development [20], [21].

Furthermore, the success of downstreaming strategies at the rural level is heavily influenced by the capacity of rural economic institutions, including the presence of local economic organizations capable of professionally managing the rural's potential. Strengthening rural economic institutions is a key factor in ensuring the sustainability of the downstreaming process, as these institutions play a role in organizing production activities, managing resources, and building economic partnerships with various stakeholders. The rural economic transformation program developed by the government also emphasizes the importance of good institutional governance and community participation in optimizing the use of rural funds for productive economic activities [22], [23].

Along with the development of digital technology, the integration of digital financial technology (fintech) has also become a key factor in supporting rural economic development. Digital financial technology enables faster, more efficient, and transparent transaction processes while expanding access to financial services for business operators in rural areas. The use of fintech can help small and medium-sized enterprises in rurals gain access to financing, improve the efficiency of payment systems, and expand marketing networks through digital platforms. Thus, financial digitalization has become a key instrument in strengthening a more inclusive and sustainable rural economic ecosystem [24].

In this context, integrating downstreaming strategies with the use of digital financial technology offers a promising approach to more effectively improve rural economic performance. By combining these two approaches, rural economic institutions such as Rural-Owned Enterprises (BUMDes) are expected to enhance operational efficiency, strengthen financial management transparency, and expand market access for rural economic products and services. Furthermore, digital innovations in the management of rural enterprises can also drive improvements in the quality of economic services provided to the community and accelerate the economic transformation of rurals toward a more modern and competitive economic system [25], [26].

Most research on Rural-Owned Enterprises (BUMDes) still focuses on institutional strengthening, organizational governance, and the economic empowerment of rural communities through improved management capacity and business unit development. However, studies that integrate the concept of rural economic downstreaming with the use of digital financial technology in the management and development of BUMDes remain relatively limited. In fact, downstreaming is not only related to increasing the added value of local resource-based products but also encompasses strengthening value chains, improving distribution efficiency, and expanding market access—all of which can be supported by digital systems such as electronic payments, app-based financial record-keeping, and access to financing through fintech. Although BUMDes possess strategic potential in driving rural economic growth, the implementation of digital financial technology in their operations has rarely been empirically studied, as much of the research still focuses on conventional business management. Furthermore, although the government has promoted the digital transformation of the rural economy through various financial inclusion policies and programs, the synchronization between policies on rural economic downstreaming, the strengthening of BUMDes, and the application of digital financial technology at the regional level still faces various challenges and has not been extensively analyzed in previous research.

Based on this background, this research aims to analyze the role of digital financial technology in supporting the downstream development of businesses managed by rural-owned enterprises (BUMDes) and its impact on improving rural economic performance in Pangkajene and Kepulauan Regency.

2. Literature Review

In addressing these various challenges, an innovative strategy is needed, one of which involves implementing downstream processing in BUMDes enterprises. Downstream processing is an effort to increase the value of products through further processing, improved packaging, and more modern marketing. Through this process, rural products are no longer marketed in their raw form but can be processed into ready-to-consume products or those with higher economic value. In the rural context, downstream processing is crucial as it transforms raw materials into processed goods with greater economic value (Kaplinsky & Morris, 2001). [27]

Along with technological advancements, the utilization of digital financial technology (fintech) has become a strategic solution in supporting the development of BUMDes. Fintech provides easy access to various financial services, such as digital payment systems, business financing, and app-based financial record-keeping. The use of this technology is particularly relevant for island regions like Pangkep, where physical access limitations can be overcome through digital technology. Fintech is an innovation in financial services that leverages technology to enhance the efficiency and accessibility of services (Gomber et al., 2018). [28]

The integration of business downstreaming and digital financial technology is expected to improve the operational efficiency of BUMDes, expand market reach, and strengthen transparency in financial management. Consequently, rural economic performance can improve, as evidenced by increased community income, job creation, and the growth of local businesses. Rural economic performance can be measured through various indicators, such as increased community income, job creation, and the growth of local businesses (Todaro & Smith, 2015). [29]

2.1. The Legal Basis of Rural-Owned Enterprises (BUMDes)

Rural-Owned Enterprises (BUMDes) are a strategic tool for economic development at the rural level, aimed at improving community welfare through the utilization and management of local potential. BUMDes are established as rural economic institutions managed independently by the rural government and the community, based on the principles of solidarity, active participation, and transparency in management. Legally, BUMDes has a strong legal foundation within the Indonesian government system. The establishment of BUMDes is regulated under Law No. 6 of 2014 on Rurals, which states that a rural may establish a business entity in accordance with the rural's needs and potential. [30] Furthermore, additional regulations regarding BUMDes are outlined in Government Regulation No. 11 of 2021 on Rural-Owned Enterprises, which confirms that BUMDes is a legal entity established by a rural and/or jointly by rurals to manage businesses, utilize assets, and develop investments and productivity. [31]

Conceptually, BUMDes functions as an economic institution that combines social and business roles. On one hand, BUMDes focuses on generating profits to increase Rural-Owned Revenue (PADes), while on the other hand, it also bears social responsibility in empowering the rural community. This aligns with the concept of a social enterprise, where business activities are not solely focused on profit but also generate social impact for the community (Nugroho, 2021). [32]

In practice, BUMDes operates various types of businesses tailored to the potential of each rural, such as savings and loan services, trade, services, the tourism sector, and the processing of agricultural and fishery products. This variety of business types reflects BUMDes' ability to adapt and develop economic activities based on the local potential of the rural. However, the management of BUMDes still faces several challenges, including limited human resource capacity, suboptimal governance, and a lack of innovation in business development. Ridlwan (2019) states that many BUMDes have not been able to develop optimally because they are still managed traditionally and have not fully utilized technology. Additionally, the success of BUMDes is significantly influenced by institutional factors and community participation. [33] Institutional theory explains that organizations with clear structures, strong rules, and

transparent management systems are better able to achieve their goals effectively (Scott, 2004). Therefore, strengthening the institutional capacity of BUMDes is a critical factor in improving business performance. [34]

Thus, BUMDes play a vital role as the driving force of the rural economy, contributing to improved community welfare. However, to achieve these goals, innovation in business management is required, including through the use of technology and development strategies such as business downstreaming.

2.2. Business Downstreaming

Business downstreaming is an economic development process that focuses on increasing the value added of products through a series of stages, ranging from further processing and distribution to marketing. This concept emphasizes that products are not merely marketed in their raw form but are processed first to achieve higher economic value and stronger competitiveness in the market. Theoretically, downstreaming is closely linked to the concept of value added, which explains that every processing step in the production chain can increase a product's economic value. Hayami et al. (1987) explain that increased value added can be achieved through changes in form, location, or timing, all of which aim to enhance economic benefits for businesses. [35]

Furthermore, downstream processing is also linked to the value chain theory proposed by Porter (1985), which emphasizes the importance of integrating every stage of production—from raw material procurement through production processes to distribution and marketing.[36] In this context, downstreaming plays a crucial role in creating efficiency and competitive advantage for a business. In the context of rural development, business downstreaming plays a vital role in increasing community income while strengthening the local economy. Through the implementation of downstreaming, the potential of a rural's natural resources—such as agricultural products, fisheries, and handicrafts—can be processed into value-added products that possess higher competitiveness at both the regional and national levels.

However, the implementation of downstream processing at the rural level still faces various obstacles, including limited processing technology, low human resource quality, and restricted access to markets and capital. These conditions result in most rural products still being marketed in their raw form, preventing their economic value from being fully maximized. Therefore, the development of business downstreaming at the rural level requires support from various parties, including the government, financial institutions, and the utilization of digital technology to strengthen production and marketing processes. Thus, downstreaming not only serves as a strategy for increasing value-added but also becomes a crucial instrument in fostering sustainable economic self-reliance in rurals.

2.3. Digital Financial Technology (Financial Technology / Fintech)

Digital financial technology, or financial technology (fintech), is an innovation in the financial services sector that leverages digital technology to deliver faster, more practical, and efficient financial services. The emergence of fintech represents a transformation from traditional financial systems toward digital-based systems capable of reaching a broader audience, including groups previously underserved by formal financial institutions. Generally, fintech encompasses various services such as digital payments, platform-based financing (peer-to-peer lending), crowdfunding, and financial management applications. These innovations enable financial transactions to be conducted more easily and efficiently without having to rely entirely on conventional banking services. According to Gomber et al. (2018), fintech is the integration of information technology with financial services aimed at enhancing efficiency, transparency, and accessibility within the financial system. [37] Meanwhile, Demirgüç-Kunt et al. (2018) explain that the development of digital financial services significantly contributes to increased financial inclusion, particularly in developing countries. [38]

In the context of rural economic development, fintech plays a crucial role in supporting various economic activities of rural communities, including the management of BUMDes enterprises. Through the use of fintech, rural entrepreneurs can conduct cashless transactions, access financing more easily, and manage their finances in a more structured and transparent manner. Additionally, fintech also plays a role in overcoming geographical barriers and infrastructure limitations commonly encountered in rural and island regions. With the availability of digital financial

services, communities are no longer entirely dependent on conventional financial institutions that are difficult to access. However, the implementation of fintech in rural areas still faces various challenges, such as low digital literacy rates, limited internet access, and a lack of public understanding regarding the use of financial technology. These conditions result in uneven adoption of fintech across different regions.

Therefore, the development of fintech in rural areas requires support in the form of improved digital literacy, strengthened technological infrastructure, and government policies that support digital financial inclusion. In this way, fintech will not only function as a transactional tool but also become a key driver in strengthening the rural economy and improving community well-being.

2.4. Rural Economic Performance

Rural economic performance can be defined as a measure of the success of economic development at the rural level, reflected in improved community well-being, the growth of local businesses, and the optimal utilization of rural resources. This performance indicates the extent to which economic activities in rural areas are able to make a positive contribution to increasing community income and quality of life. Generally, rural economic performance can be assessed through several key indicators, including increases in rural residents' income, labor absorption, the growth of micro- and small enterprises, and increased contributions to Rural-Owned Revenue (PADes). These indicators suggest that rural economic development focuses not only on growth but also on equity and sustainability. According to Todaro and Smith (2015), economic development is not only measured by output growth but also by the ability to reduce poverty, inequality, and unemployment. In the rural context, this means that the success of the rural economy must be able to create direct benefits for the broader community. [39]

Furthermore, rural economic performance is also influenced by institutional factors and the management of local resources. The existence of rural economic institutions such as BUMDes is a key factor in driving local economic growth. BUMDes plays a role in managing rural potential, creating added value, and generating employment opportunities for the community (Nugroho, 2021). [40] From a development economics perspective, rural economic performance is also linked to the concept of inclusive growth—economic growth that involves all segments of society and delivers equitable benefits. This concept emphasizes the importance of access to various economic resources, such as capital, technology, and markets.

On the other hand, the development of digital technology has a significant impact on rural economic performance. The utilization of technology, including fintech and the digitalization of rural businesses, has proven to enhance transaction efficiency, expand market reach, and boost the productivity of local enterprises. However, efforts to improve rural economic performance still face various challenges, such as infrastructure limitations, low human resource quality, and limited access to technology and financing. These conditions have resulted in uneven rural economic development across various regions. Therefore, an integrated rural economic development strategy is needed, encompassing the strengthening of rural economic institutions, the utilization of digital technology, and the enhancement of community capacity. In this way, rural economic performance can continue to improve sustainably and have a tangible impact on community well-being.

2.5 3. Methodology

This research methodology employs a mixed-methods approach that combines quantitative and qualitative methods to gain a comprehensive understanding of the downstream development of rural-owned enterprises (BUMDes) based on digital financial technology in Pangkajene and Kepulauan Regency, South Sulawesi. This approach was chosen because it integrates numerical data analysis with a contextual understanding of the social and institutional phenomena occurring at the rural BUMDes management level. Quantitative research emphasizes objective phenomena through quantitative analysis as an effort toward measurable objectivity, specifically using numbers and statistical processing (Sukmadinata, 2009). [41] Qualitative research, on the other hand, is used to investigate, discover, describe, and explain the qualities or unique aspects of social influences that cannot be explained, measured, or described through a quantitative approach (Saryono, 2010). [42]

In the first phase, the study was conducted through a quantitative survey of BUMDes managers, rural government officials, and local business actors involved in rural economic activities. Data collection was carried out using a structured questionnaire designed to measure several key research variables, namely the adoption of digital financial technology, BUMDes business management capacity, the level of business innovation, and rural economic performance. The questionnaire was structured using specific measurement scales, such as the Likert scale, to obtain data that could be statistically analyzed. The collected data was then analyzed using descriptive statistics to describe respondent characteristics and the general conditions of the research variables, as well as regression analysis to test the relationships and influences between variables, particularly between the adoption of digital financial technology and improvements in business capacity and rural economic performance.

In the second phase, the research continued with a qualitative approach to deepen the findings of the quantitative analysis. Data collection was conducted through in-depth interviews and Focus Group Discussions (FGDs) involving BUMDes managers, rural officials, and relevant stakeholders such as rural facilitators and local business operators. The interview approach was chosen because interviews provide space for longer conversations, allowing researchers to gain insights into how people think and what they believe. In-depth interviews go further, using probing and open-ended questions to uncover more details about the subject (Knott et al., 2022). [43] Interviews and FGDs aim to gather deeper information regarding experiences, perceptions, and the dynamics occurring in the process of implementing digital financial technology in BUMDes. Additionally, this method is used to identify supporting factors, implementation constraints, and strategies that can be implemented to strengthen the utilization of digital technology in rural enterprise development.

The results of the analysis from both approaches were then integrated through a data triangulation process, ensuring that the research findings not only provide a statistical overview of the relationships between variables but also explain the social, institutional, and policy contexts influencing the success of digital financial technology implementation in BUMDes development. Thus, this methodology is expected to yield a more comprehensive analysis and provide relevant policy recommendations for strengthening the rural economy based on digital innovation.

Table 1

Variable	Operational Definition	Indicator	Measurement Item	Scale
Adoption of Digital Financial Technology (X1)	The level of digital technology adoption in transaction systems, financial management, and access to financing for Rural-Owned Enterprises (BUMDes) to improve business operational efficiency	Use of digital payment systems Use of digital financial record-keeping applications Utilization of fintech services for financing Integration of digital systems into business transactions. Digital literacy of BUMDes managers	BUMDes uses digital payments for business transactions BUMDes Management use digital financial record-keeping applications BUMDes utilizes fintech services to access financing BUMDes transaction systems are digitally integrated Management have the ability to use digital technology	Likert 1–5

Downstreaming of BUMDes Business Development (X2)	The process of increasing the value added of rural business products and services through the processing of local resources, product innovation, and the strengthening of business value chains	Processing of value-added local products Diversification of BUMDes business units Strengthening distribution and marketing chains Product and business service innovation Utilization of digital marketing	BUMDes processes local products into value-added BUMDes processes local products into value-added products BUMDes develops various new business units BUMDes has a distribution network for rural products BUMDes innovates its products or business services BUMDes products are marketed through digital media	Likert 1–5
Rural Economic Performance (Y)	The extent of growth in rural economic activity, as evidenced by business growth, increased income, and the contribution of BUMDes to the local economy	Increasing BUMDes revenue Increasing income for rural communities Creating jobs in rural areas Growth of rural microenterprises Contribution to Rural Original Revenue (PADes)	BUMDes revenue has increased BUMDes businesses increase ruralrs' income BUMDes creates new job opportunities BUMDes Rural micro-enterprises grow through BUMDes activities BUMDes contributes to the Rural Revenue Fund (PADes)	Likert 1–5

5-point Likert scale

1 = Strongly Disagree

2 = Disagree

3 = Neutral / Undecided

4 = Agree

5 = Strongly Agree

The operationalization of these variables forms the basis for the development of the research questionnaire, which can then be analyzed using descriptive statistics and regression analysis to examine the influence of digital financial technology adoption on the downstream expansion of BUMDes businesses and its impact on rural economic performance

The number of informants in this research was set at 100. The sample consists of BUMDes managers and rural government officials and was selected based on specific characteristics. The sampling method, following Cochran (1977), uses the following formula:

$$n = \frac{N}{Ndx^2 + 1}$$

Where n refers to the sample size, N refers to the population size, and d refers to the margin of error (0.5), or 5%, at a 95% confidence level (Cochran, 1977). [44] Subsequently, data analysis was conducted by sequentially combining qualitative and quantitative analyses. This means that the steps used for qualitative research were also applied to quantitative research. In terms of interpretation or analysis, the data were then reduced—that is, qualitative and quantitative data were categorized for statistical calculations. The data was subsequently interpreted using triangulation based on the data collected in the field. Furthermore, data reduction was performed by grouping and categorizing the data in accordance with the research objectives.

3. Results and Discussion

1.1. Geographical and Administrative Location

Pangkajene and Kepulauan Regency is a region characterized by both mainland and island territories, boasting diverse economic potential, such as the fisheries sector, agriculture, and rural-based microenterprises. According to the publication Pangkajene and Kepulauan Regency in Figures 2025 issued by the Central Statistics Agency, astronomically, Pangkajene and Kepulauan Regency are situated between 4°40' S and 8°00' S and 110° E and 119°48'67" E. 2. Based on its geographical position, Pangkajene and Kepulauan Regency is bordered by: Barru Regency to the north, Maros Regency to the south, Maros and Bone Regencies to the east, and the Makassar Strait to the west. Pangkajene and Islands Regency covers an area of 1,112.29 km² and comprises 133 islands. The population is approximately 363,450, with an economic growth rate of around 5.00 percent and a poverty rate of 11.60 percent. [45]

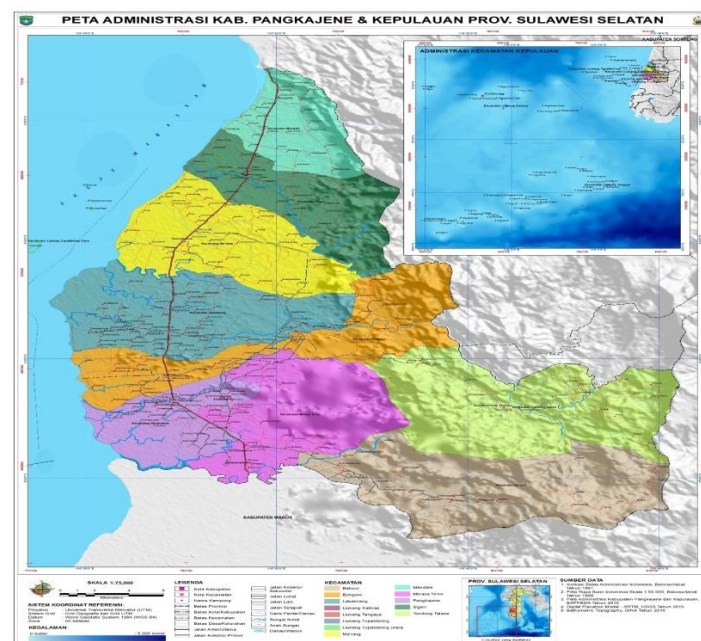


Figure 1: Map of Pangkajene and Kepulauan Regency

Although showing a positive trend, challenges remain in ensuring equitable economic development, particularly in rural and island areas. In this context, Rural-Owned Enterprises (BUMDes) serve as a strategic instrument in promoting rural economic self-reliance. However, the management of BUMDes in Pangkep Regency still faces various obstacles, such as limited market access, low financial literacy, and the suboptimal use of digital technology in business management. Along with technological developments, the use of digital financial technology (fintech) has become one of the innovative solutions to improve BUMDes performance. Fintech can facilitate transaction access, expand marketing reach, and improve transparency and efficiency in rural financial management. This is particularly relevant for Pangkep Regency, which comprises an archipelago where physical access limitations often hinder economic activities. Additionally, a business downstreaming strategy for BUMDes plays a crucial role in increasing the value added of local products. Through downstream processing, rural products are not only sold in their raw form but are also processed into products with higher economic value. The integration of business downstreaming and the utilization of digital financial technology is expected to strengthen rural economic performance, increase community income, and reduce poverty levels.

2.2. Multiple Linear Regression Analysis for Each Variable

Multiple linear regression is a method used to analyze the relationship between one dependent variable and several independent variables simultaneously. This approach helps researchers assess the collective influence of various factors on a phenomenon under study. The relationship between variables in the model is expressed in the following mathematical equation:

Table 2. Multiple linear regression analysis

Coefficients ^a											
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero - order	Partial	Part	Tolerance	VIF
1	(Constant)	43.331	7.400		5.855	.000					
	Adoption of Digital Financial Technology	0.111	0.181	0.061	1.711	0.004	0.074	0.062	0.061	0.995	1.005
	Downstreaming of BUMDes Business Development	0.238	0.126	0.188	1.891	0.002	0.193	0.189	0.188	0.995	1.005
a. Dependent Variable: Rural Economic Performance											

Source: SPSS analysis results

From the regression results, the following equation model was obtained:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2$$

$$Y = 43.331 + 0.111 X_1 \text{ and an explanation of each variable}$$

a. Constant (43.331)

The constant value indicates that if all independent variables remain unchanged (assumed to be zero), the predicted value of Rural Economic Performance remains at 43.331. This value serves as the baseline for initial calculations before considering the contributions of other factors.

b. Adoption of Digital Financial Technology (X1)

A coefficient of 0.111 indicates that if there is a one-unit increase in the Digital Financial Technology Adoption variable, the Rural Economic Performance value is estimated to increase by 0.111 points, provided that other variables are held constant. Although the magnitude of the effect is relatively small, this result still demonstrates that improvements in Digital Financial Technology Adoption play a significant role in the development of Rural Economic Performance.

c. Downstreaming of BUMDes Business Development (X2)

The coefficient of 0.238 indicates that a one-unit increase in BUMDes Business Development Downstreaming can lead to a 0.238-point increase in Rural Economic Performance. This suggests that without comprehensive management, partially improved BUMDes Business Development Downstreaming may not be effective in enhancing Rural Economic Performance. Downstreaming of BUMDes Business Development has the largest contribution compared to other variables in this model.

d. t-Test (Partial Test)

The t-test is used to measure the extent to which each independent variable individually influences the dependent variable, namely Rural Economic Performance. The test results show that all variables have a significance level below 0.05. Thus, statistically, it can be concluded that both independent variables have a significant effect on Rural Economic Performance when tested individually. This can be seen in Table 1 above.

e. F-Test (Simultaneous Test)

The F-test is used to evaluate the simultaneous effect of all independent variables on the dependent variable. Based on the analysis results, the calculated F-value is 26.064 with a significance level of 0.000. This indicates that, collectively, all independent variables have a significant effect on rural economic performance at a 97% confidence level, as shown in the table below:

Table 3 Simultaneous F-Test

ANOVAa						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.296	2	4.648	26.064	.000b
	Residual	218.464	97	2.252		
	Total	227.760	99			
a. Dependent Variable: Rural Economic Performance						
b. Predictors: Constant, Downstream Business Development of Rural-Owned Enterprises (BUMDes), Adoption of Digital Financial Technology						

Source: SPSS analysis results

f. Coefficient of Determination Test

The coefficient of determination analysis is used to assess the extent to which the independent variables collectively explain the variation in the dependent variable, namely rural economic performance. This coefficient value reflects the regression model's ability to predict the dependent variable. Details regarding this value are presented in Table 4 below.

Table 4 Coefficient of Determination Test

Model Summary^b											
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson	
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.202a	.41	.21	1.50074	.41	2.064	2	97	.133	2.508	
a. Predictors: (Constant), Downstream Business Development of Rural-Owned Enterprises (BUMDes), Adoption of Digital Financial Technology											
b. Dependent Variable: Rural Economic Performance											

Source: SPSS analysis results

Based on the analysis results, an R-squared value of 0.41 indicates that approximately 41% of the variation or change in rural economic performance can be explained by the two independent variables used in the regression model. Meanwhile, the remaining 59% is influenced by other factors not included in the model and not yet analyzed in this study. These findings suggest that while variables such as downstreaming of BUMDes business development and adoption of digital financial technology contribute, there are still various other factors outside the model that require further investigation to gain a more comprehensive understanding of the causes of stunting in the study area.

2.3. Analysis Results

a. The Effect of Digital Financial Technology Adoption on Rural Economic Performance Based on the SPSS analysis results, the Digital Financial Technology Adoption variable was found to have a significant and positive effect on Rural Economic Performance, with an F-value of 26.064 and a significance level of 0.000 (calculated t-value = 1.711 and table t-value = 1.66071, with a significance level of 0.004).

b. The Effect of Downstream Business Development in BUMDes on Rural Economic Performance Based on the results of the SPSS analysis, the variable “Downstream Business Development in BUMDes” was found to have a significant and positive effect on Rural Economic Performance, with an F-value of 26.064 and a significance level of 0.000 (calculated t-value = 1.891 and table t-value = 1.66071, with a significance level of 0.002).

4. Discussion

4.1. Adoption of Digital Financial Technology

The results of the F-test conducted in this study indicate a linear relationship between Digital Financial Technology Adoption (X1) and Rural Economic Performance (Y), with a value of 26.064 and a significance level of 0.000, as shown in Table 3: F-Test Results – Simultaneous Test above. It can be seen that the effect of digital financial technology adoption (X1) on rural economic performance (Y), based on Table 2, shows a calculated t-value of 1.711 with a Sig. value of 0.004, which is smaller than 0.05. This indicates that, at a 95% confidence level, it can be interpreted that the Digital Financial Technology Adoption (X1) variable has a significant and positive effect on Rural Economic Performance (Y). Meanwhile, the results of the Coefficient of Determination test can be seen in Table 4 above: An R² value of 0.41 indicates that the digital financial technology adoption variable (X1) explains 41 percent of the variation in rural economic performance.

These findings align with the results of in-depth interviews with informants at several BUMDes. Most informants revealed that the implementation of digital financial technology by BUMDes is still in the early stages of

development. One informant stated, “Some BUMDes have begun using digital payment services, such as bank transfers and digital wallets, but their utilization has not yet become widespread among the community.” This indicates that the community’s digital literacy remains a major challenge in optimizing digital financial technology. Based on the interview results, the adoption of digital financial technology by BUMDes in Pangkep Regency demonstrates significant potential in driving improvements in rural economic performance. However, its success rate is highly dependent on the community’s digital literacy and the readiness of available infrastructure, as well as support from the government and various relevant stakeholders. According to Venkatesh et al. (2003), technology adoption is influenced by performance expectancy, effort expectancy, social influence, and facilitating conditions. [46] Empirical studies indicate that social factors and infrastructure support have a significant influence on technology adoption, particularly in developing regions (Venkatesh et al., 2003; Oliveira et al., 2016). [47] In rural-level implementation, government support, internet network availability, and the role of community leaders are key factors in driving the adoption of digital financial technology.

Digital financial technology adoption in this study refers to the level of utilization and implementation of various digital technologies used in transaction systems, financial management, and access to financial services within the operations of Rural-Owned Enterprises (BUMDes). Digital financial technology (financial technology/fintech) serves as a vital instrument in supporting rural economic transformation by enhancing the efficiency, transparency, and accountability of rural enterprise management. In the context of BUMDes management, the adoption of digital financial technology can be realized through the use of digital payment systems, digital-based financial recording applications, electronic banking services, and fintech platforms that facilitate access to financing and business transactions. Technology adoption is influenced by two main factors: perceived usefulness and perceived ease of use. Empirical research indicates that these two factors have a significant influence on interest in and behavior regarding technology use (Davis, 1989; Venkatesh & Davis, 2000). [48] [49]

The adoption of digital financial technology is also linked to the ability of BUMDes managers to utilize such technology to support business activities and services to the community. The implementation of digital systems in financial transactions can accelerate payment processes, simplify financial recording and reporting, and improve the accuracy of financial data. Additionally, digital technology enables BUMDes to expand their business networks through integration with digital platforms, such as marketplaces or electronic payment systems, thereby broadening market access for rural products.

In practice, the level of adoption of digital financial technology in BUMDes is influenced by various factors, including the digital literacy of managers, the availability of technological infrastructure and internet connectivity, government policy support, and the institutional readiness of BUMDes to innovate in business management. A high level of digital technology adoption is expected to drive the modernization of BUMDes management systems and strengthen financial governance that is more transparent and accountable. Financial inclusion refers to the ease of public access to affordable and quality formal financial services (Demirgüç-Kunt et al., 2018). [50] Research indicates that the use of digital technology in financial services can enhance public access to the financial system and drive economic growth (Ozili, 2018; Sahay et al., 2020). [51] [52]

Thus, based on the various theories employed and supported by previous research findings, it can be concluded that the adoption of digital financial technology in BUMDes is influenced by several factors, such as individual perceptions of technology, the characteristics of the innovations used, the influence of the social environment, and the availability of supporting infrastructure. The integration of these various factors is a crucial element in determining the success of technology implementation while enhancing economic performance in rural areas. The adoption of digital financial technology is a key variable in this study because it serves as a factor that can drive improvements in BUMDes business management capacity, strengthen the process of rural economic downstreaming, and ultimately contribute to enhanced rural economic performance through the growth of local economic activities and improved well-being of rural communities.

4.2. Downstreaming of BUMDes Business Development

The results of the F-test conducted in this study indicate that there is a linear relationship between the downstreaming of BUMDes business development (X_2) and rural economic performance (Y), with a value of 26.064 and a significance level of 0.000, as shown in Table 3: F-Test Results – Simultaneous Test above. It can be seen that the effect of BUMDes Business Development Downstreaming (X_2) on Rural Economic Performance (Y), based on Table 2, shows a calculated t-value of 1.891 with a Sig value of 0.002, which is smaller than 0.05. This indicates that, at a 95% confidence level, it can be interpreted that the downstreaming of the BUMDes Business Development (X_2) variable has a significant and positive effect on Rural Economic Performance (Y). Meanwhile, the results of the coefficient of determination test can be seen in Table 4, where the R^2 value of 0.41 indicates that the downstream BUMDes business development (X_2) variable explains 41 percent of the variation in rural economic performance.

This finding aligns with the results of in-depth interviews with informants at several BUMDes. Most informants revealed that a portion of the community has begun to understand the concept of BUMDes business downstreaming as a form of business development encompassing processes from the upstream sector through to processing and marketing stages. Some informants also noted that the role of BUMDes is no longer limited to collecting production outputs but has begun to expand toward processing and marketing those products. One informant stated, "BUMDes now not only buys fish catches or farm harvests but has also started helping to process them and market them to wider areas." Nevertheless, there are still some community members who do not fully understand this downstreaming concept. The development of BUMDes business downstreaming in Pangkep Regency has begun but remains in the early stages of growth. The community is beginning to feel positive impacts, such as increased product value-added and rising incomes. However, its implementation still faces several challenges, including limited capital, human resource quality, and inadequate infrastructure. Overall, BUMDes business downstreaming holds significant potential to enhance rural economic performance if it receives optimal support.

Downstreaming in BUMDes business development is a strategic approach to strengthening the rural economy that focuses on increasing the value added of local resource potential through processing, product innovation, and the strengthening of production and marketing value chains. In the context of Rural-Owned Enterprises (BUMDes), downstreaming is not merely interpreted as the effort to process raw materials into finished products but also encompasses the development of an integrated business system spanning production, processing, distribution, and the marketing of products or services based on the economic potential of the rural. Research indicates that strengthening local value chains can increase community income and the competitiveness of the rural economy (Kaplinsky & Morris, 2001; Gereffi, 2018). [53][54]

The concept of downstream processing in the development of BUMDes aims to optimize the utilization of local resources to generate higher economic value. This can be achieved through the development of business units that process local commodities, such as agricultural products, fisheries, rural tourism, and community handicrafts. Through the downstream processing process, BUMDes can create more competitive products, expand markets, and increase community and rural income. Thus, BUMDes functions not only as a rural economic institution but also as a driving force for local economic development. According to North (1990), strong institutions can reduce transaction costs and improve economic performance. [55] In this context, BUMDes plays a role in creating a more organized production and marketing system, thereby increasing the value added of rural products.

Furthermore, the downstream development of BUMDes businesses is also linked to efforts in business diversification and product innovation. BUMDes are encouraged to develop various types of businesses with market potential that can provide sustainable economic benefits for the rural community. Innovation in product processing, packaging, marketing, and business services is a key factor in enhancing the competitiveness of rural products. In this context, strengthening the business management and entrepreneurial capacities of BUMDes managers is a critical determinant of the success of the downstreaming process. According to Vázquez-Barquero (2002), endogenous development emphasizes the importance of utilizing local resources, knowledge, and capacity to drive economic growth. [56] In the context of BUMDes downstreaming, transforming agricultural, fisheries, and other local resources into processed products represents an optimal utilization of rural potential to improve community welfare.

In its development, the downstream processing of BUMDes enterprises is increasingly supported by the use of digital technology, including in marketing, distribution, and business management systems. Digital technology enables rural products to reach broader markets through digital platforms or marketplaces, thereby accelerating the commercialization of local products. This integration of business downstreaming and digital technology is a key strategy for improving the efficiency and effectiveness of rural business management. Ellis's (2000) research indicates that diversifying economic activities in rural areas can increase household income and reduce economic vulnerability. [57] Therefore, the downstreaming of BUMDes businesses is a crucial strategy for creating new jobs and enhancing the economic stability of rural communities.

Thus, based on existing theories and supported by previous research findings, it can be concluded that the development of BUMDes business downstreaming is a crucial strategy for enhancing the value added of the rural economy. Synergy between strengthening value chains, developing economic institutions, building on local potential, and diversifying rural economic activities are key factors in driving sustainable improvements in rural economic performance. The downstream development of BUMDes enterprises can be understood as a process of rural economic transformation that emphasizes the creation of added value, business innovation, and the strengthening of local economic value chains. Through this approach, BUMDes are expected to become strategic instruments in enhancing rural economic self-reliance, expanding employment opportunities, and fostering more inclusive and sustainable rural economic growth.

5. Conclusion

1. The research findings indicate that the implementation of digital financial technology and the downstream development of BUMDes businesses have a significant and positive impact on rural economic performance in terms of improving financial transparency, operational efficiency, and expanding the marketing network for rural products managed by BUMDes.
2. Qualitative findings also reveal that the success of BUMDes digitalization is heavily influenced by human resource capacity, support from rural government policies, and the availability of digital infrastructure. Thus, the development of BUMDes downstreaming based on digital financial technology can serve as an innovative strategy to strengthen rural economic performance and promote sustainable rural economic development.

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The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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