The Impact of Digitalization on the Development of Village-Owned Enterprises (BUM Desa)

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Abstract. Village-Owned Enterprises (BUM Desa) are an initiative launched by the Indonesian government to drive rural development by optimizing local economic potential and empowering village communities. These enterprises play a vital role in fostering economic inclusivity and reducing regional disparities. The performance of BUM Desa is commonly evaluated using a tiered ranking system, which includes the categories of advanced, developing, beginner, and pioneer. In the context of an increasingly digital world, digital transformation offers a strategic avenue for BUM Desa to strengthen their management practices, enhance service delivery, and improve their overall performance rankings. This study investigates how digitalization impacts the managerial development of BUM Desa. Drawing on primary data from 165 BUM Desa across various regions in Indonesia, the study employs a multinomial logit model to analyze the relationship. The results highlight that the digitalization of decision-making processes, core business functions, and marketing efforts significantly contributes to the advancement of BUM Desa. Additionally, collaboration with suppliers, investors, and other relevant stakeholders facilitates access to critical resources, expertise, and networks—key factors in overcoming operational challenges and achieving long-term sustainability.

Keywords: Digitalization, Village-owned Enterprises, Multinomial Logit, Rural Transformation.

1 Introduction

The advancement of digital technology has significantly transformed various economic sectors, including businesses and Micro, Small, and Medium Enterprises (MSMEs). Digitalization enables business actors to harness diverse technological platforms, such as e-commerce, social media, and business management applications, to improve operational efficiency and expand market access [1]. According to data from the Ministry of Cooperatives and SMEs, approximately 64.2 million MSMEs in Indonesia have begun transitioning to digital platforms for both sales and marketing purposes. This underscores the crucial role digitalization plays in supporting the competitiveness of MSMEs in an era characterized by globalization and digital transformation [2].

Digitalization extends beyond simply shifting business operations to online platforms; it also entails restructuring business processes to become more efficient, faster, and integrated. Companies that successfully adopt digital technologies can reduce operational costs, accelerate innovation, and enhance customer experience [3]. Moreover, digitalization broadens market access, especially with the rise of e-

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commerce and fintech, allowing businesses to reach a wider consumer base without being constrained by geographical boundaries. Thus, implementing digitalization is a key factor in maintaining business sustainability and competitiveness in the modern era [4].

The application of digitalization in remote, outermost, and disadvantaged regions (3T) and rural areas holds significant potential for accelerating economic development and improving local community welfare. Through digital initiatives such as Smart Village programs and the provision of internet infrastructure, individuals in remote areas gain access to improved information, education, and healthcare services [5]. Digitalization also bolsters the development of Village-Owned Enterprises (BUM Desa) by facilitating access to broader markets and enabling more efficient business management [6]. However, challenges such as limited infrastructure and low digital literacy present significant barriers that need to be addressed.

To promote the improvement of welfare in rural areas through community empowerment, Law No. 6 of 2014 on Villages was enacted, granting villages the authority to manage local governance and community interests based on community initiatives, original rights, and/or traditional rights recognized within Indonesia's governance system. The law also stipulates that villages can establish Village-Owned Enterprises (BUM Desa), which are managed with a spirit of kinship and cooperation, and may engage in economic and/or public service activities in accordance with applicable regulations. BUM Desa serves as a business entity at the village level, aimed at fostering the village economy through the production of local products [7].

However, the sustainability of many BUM Desa is at risk due to ineffective business models. As of 2023, a total of 1,118 BUM Desa have been ranked nationally, with 619 already possessing legal status (Kepmendes No. 7 of 2023) or transitioning to incorporated entities. Among these BUM Desa, four ranking categories exist: advanced, developing, beginner, and pioneer. The advanced category dominates, accounting for 33% of all ranked BUM Desa [8]. Furthermore, 55.3% of the 1,118 BUM Desa have obtained legal status, and 56% of those with legal status are classified as advanced. However, it remains unclear whether these advanced BUM Desa have achieved true competitiveness.

Given the importance of digitalization in business, particularly for BUM Desa, this paper seeks to analyze the impact of digitalization on the development of BUM Desa management. This study aims to contribute to the development of BUM Desa by exploring how digitalization can be utilized to enhance BUM Desa business performance.

2 Literature

2.1 Digitalisation in Business

Digitalization in business refers to the transformation of activities, processes, competencies, and business models through the adoption of digital technologies to optimize operational efficiency, drive product innovation, and enhance customer experience. According to Parida, Sjödin, and Reim [9], digitalization involves "the significant integration of digital technologies into all aspects of business, leading to fundamental changes in how companies operate and deliver value." This

transformation includes the adoption of tools such as e-commerce, big data analytics, cloud computing, and the Internet of Things (IoT), which enhance a company's competitive advantage.

The importance of digitalization in business can be observed in several key areas::

1. Efficiency and Productivity: Digitalization improves business processes by automating routine tasks and minimizing manual interventions, resulting in higher productivity and cost savings for companies [9].
2. Customer Engagement: Digital platforms enable businesses to engage with customers more effectively by providing personalized experiences, leading to improved customer satisfaction and retention [10].
3. Data-Driven Decision Making: With digitalization, businesses have access to real-time data, allowing for better decision-making based on insights from large datasets [11].
4. Global Reach: Digital technologies eliminate geographical barriers, enabling businesses to expand into global markets and explore new customer segments [12].
5. Innovation: Digitalization encourages innovation by facilitating the rapid development of new products and services that meet evolving customer demands [13,14].

According to Pangestika [15], digital marketing offers several benefits for businesses in promoting their products or services:

1. Speed of Dissemination: Digital marketing strategies can be implemented swiftly, sometimes within seconds. Additionally, the performance of digital marketing campaigns can be measured in real-time with high accuracy.
2. Ease of Evaluation: Online platforms allow businesses to instantly track the results of marketing activities. Information such as product view duration, sales conversion rates from each ad, and more can be easily monitored.
3. Wider Reach: The broad geographical reach of digital marketing enables businesses to market their products globally with minimal effort using internet platforms.

2.2 Village-Owned Enterprises (BUM Desa)

As part of the efforts to strengthen and transform the institutional structure of Village-Owned Enterprises (BUM Desa), the Indonesian government issued Government Regulation No. 11 of 2021 concerning Village-Owned Enterprises in February 2021. As highlighted in the article *Resilience of Village-Owned Enterprises in the Pandemic Era: A Case Study Approach* by Suartana et al. [16], BUM Desa were established by village governments to support the local economy and develop the village's economic potential, institutional structures, and natural and human resources to improve community welfare. BUM Desa operate under the highest authority of the Village Deliberation. Profits from BUM Desa serve as a source of the village's original revenue, which is then reinvested in village development.

To assess the progress of BUM Desa and BUM Desa Bersama, the Ministry of Villages, Disadvantaged Regions, and Transmigration of the Republic of Indonesia ranks BUM Desa. The ranking process is conducted through a questionnaire available on a designated ranking website. Responses are validated and verified by a team that determines the final status of each BUM Desa or BUM Desa Bersama.

Several indicators are used in the BUM Desa ranking process:

1. **Institutional Structure**: This includes the supporting infrastructure and personnel of BUM Desa and BUM Desa Bersama.
2. **Management**: This is evaluated based on the presence of planning mechanisms within BUM Desa and BUM Desa Bersama, including work program plans, standard operating procedures (SOP), and the use of digital technology in management.
3. **Business and/or Business Units**: This assesses aspects such as business licensing, product standardization/certification, business turnover, profitability, collectability (for financial businesses), post-harvest processing (for agricultural businesses), and the availability of facilities (for tourism businesses).
4. **Partnership/Collaboration**: This includes both business and non-business partnerships as stipulated in the Articles of Association/Bylaws.
5. **Assets and Capital**: This assesses the condition of BUM Desa's and BUM Desa Bersama's assets and capital, including total capital, capital sources, and profitability.
6. **Reporting and Accountability**: This refers to compliance with regulations governing BUM Desa and BUM Desa Bersama, requiring regular reporting as a form of business accountability.
7. **Benefits for the Village and Community**: Beyond generating business profits, BUM Desa and BUM Desa Bersama are expected to provide benefits for the village, such as contributing to the village's original revenue and creating job opportunities for the local community.

The ranking of BUM Desa and BUM Desa Bersama is based on a scoring system that evaluates each of these indicators, with the results converted into classifications: Pioneer, Beginner, Developing, and Advanced. The score thresholds for these classifications are established under Government Regulation No. 11 of 2021 and Ministerial Regulation No. 3 of 2021, and are as follows:

a. **Pioneer**: BUM Desa with a score of less than 55.
b. **Beginner**: BUM Desa with a score of 55-70.
c. **Developing**: BUM Desa with a score of 70-85.
d. **Advanced**: BUM Desa with a score of 85 or above.

3 Method

3.1 Data and Sources of Data

This study utilizes primary data from 153 samples collected from 178 respondents representing Village-Owned Enterprises (BUM Desa) in Indonesia. The sample is drawn from 30 provinces, and the survey was conducted via zoom meeting to guide respondents on completing the online questionnaires.

The total population of this study consists of 431 BUM Desa across all provinces in Indonesia, provided by the Ministry of Villages, Disadvantaged Regions, and Transmigration of the Republic of Indonesia. The data was gathered between July and August 2024 through a structured online questionnaire that included both quantitative and qualitative data.

3.2 Description of Variables in the Model

In this study, we examine digitalization and its impact on BUM Desa management development. The dependent variable is the ranking of BUM Desa, as outlined by the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration of

the Republic of Indonesia's Ministerial Decree No. 7 of 2023 on Village-Owned Enterprises rankings. The dependent variable consists of five classifications: (1) No Rank, (2) Pioneer, (3) Beginner, (4) Developing, and (5) Advanced.

We also consider several control variables that may influence BUM Desa management, derived from previous literature [11], [17]-[19], and the indicators used in BUM Desa ranking. These variables include the age of BUM Desa, digitalized key activities, digitalized decision-making, benefits for the village community, digital marketing, key partnership, customer relationship, and the value of BUM Desa's assets.

Table 1. Variables and research data

No	Variable	Description	Data Type	Source
	Variable dependent (Y)			
1.	Ranking	Ranking of BUM Desa based on Ministerial Decree No. 7 of 2023	Skala Likert 1-5	Primary Data (Survey), Ministry of Villages Database
	Variable Independent (X)			
1.	Age of BUM Desa	Age of BUM Desa	Year	Primary Data (Survey)
2.	Digitalized Key Activities	Use of digitalization in decision-making such as having ISO, Shareholders' Meetings	Likert Scale 1-4; PCA factor score	Primary Data (Survey)
3.	Digitalized Decision-Making	An indicator in BUM Desa ranking reflecting benefits to the village community	Likert Scale 1-4; PCA factor score	Primary Data (Survey)
4.	Benefits for the Village Community	Digitalized marketing system, including cost reductions for consumers and faster information access	Likert Scale 1-4; PCA factor score	Primary Data (Survey)
5.	Digital Marketing	An indicator in BUM Desa ranking related to partnerships	Likert Scale 1-4; PCA factor score	Primary Data (Survey)
6.	Key Partnership	Customer engagement to improve satisfaction and retention	Likert Scale 1-4; PCA factor score	Primary Data (Survey)
7.	Customer Relationship	Use of digitalization in decision-making such as having ISO, Shareholders' Meetings	Likert Scale 1-4; PCA factor score	Primary Data (Survey)
8.	The Value of BUM Desa's Assets	The value of BUM Desa assets in 2023	Rupiah	Ministry of Villages Database

3.2 Model

This study employs principal component analysis (PCA) or factor analysis to identify the independent variables from the qualitative data. PCA is used to reduce complex, correlated data into a smaller set of variables that explain the most variance. In PCA, the questionnaire responses are rated on a Likert scale of 1-4 (strongly disagree to

strongly agree). After determining the independent variables listed in Table 1, a multinomial logit model is applied to examine the impact of digitalization on BUM Desa management development.

The Multinomial Logit (MNL) method is a regression technique used to model and predict categorical response variables with three or more categories [20]. This method involves building a logistic model for each response category and comparing the probabilities of each category with the reference or base outcome. The base outcome serves as a reference for comparing the probabilities of alternative choices.

To assess whether the independent variables influence the dependent variable, a regression analysis is required. In this study, the dependent variable is categorical, representing the development of BUM Desa management. The logit model is used to estimate relationships when the dependent variable is categorical [20]. According to Wooldridge [21], the logit model is a method for estimating categorical variables using the logistic distribution function.

The focus of this research is to identify factors that influence the development of BUM Desa, where the dependent variable is divided into five ranking categories: 0 = No Rank, 1 = Pioneer, 2 = Beginner, 3 = Developing, and 4 = Advanced. Thus, a multinomial logit analysis is required to analyze these factors.

Factor analysis

The variables were developed using BUM Desa's responses to attitudinal questions provided in the Attachment 1. These questions measure the latent constructs of each variable. Dimensionality was assessed using PCA with varimax rotation. All items with Eigen values above one were retained, and items with factor loadings above 0.50 were included, while those with cross-loadings above 0.50 were excluded (see Attachment 1). Initially, multiple statements were used to measure each variable, and Cronbach's Alpha was calculated to test the reliability of variables with more than one latent construct.

The PCA results indicated multiple dimensions for several variables. They include digitalized key activities, digitalized decision-making, digital marketing, customer relationship, key partnership, and benefits for the village community (detailed in the Attachment 1).

The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO-MSA), Cronbach's Alpha, and Explained Variance were applied for all variables with multiple constructs to assess the appropriateness of PCA for these variables. All measurements passed the required tests, as the KMO-MSA values were greater than 0.50, as suggested by Nunnally [22]. Hence, the latent constructs for all variables were confirmed as valid representations of the independent variables.

Statistical analyses

Multivariate analysis of variance (MANOVA) and post-hoc tests were conducted to test the hypotheses that significant differences exist in the level of BUM Desa management development, antecedents of BUM Desa rankings, and control variables among the samples. The independent variables include age of BUM Desa, digitalized key activities, digitalized decision-making, benefits for the village community, digital marketing, key partnership, customer relationship, and the value of BUM Desa's assets. Multivariate differences between groups were assessed using the Wilks' Lambda criterion (U Statistic). The test evaluated whether differences exist across groups

without concern for specific linear combinations of the dependent variable [23]. Finally, linear regression modeling was applied to determine which independent variables influence the development of BUM Desa management.

The multinominal logit model in this research is as follows:

$$\frac{P(\text{Advanced})}{P(Norank)} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e \quad (1)$$

$$\frac{P(\text{Advanced})}{P(Pioneer)} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e \quad (2)$$

$$\frac{P(\text{Advanced})}{P(Beginner)} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e \quad (3)$$

$$\frac{P(\text{Advanced})}{P(Developing)} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e \quad (4)$$

Where:

P	= Probability
Norank	= No ranking
Pioneer	= Pioneer ranking
Beginner	= Beginner ranking
Developing	= Developing ranking
Advanced	= Advanced ranking
β_0	= Intercept
$\beta_{1,2,\ldots,8}$	= Coefficient
X_1	= Age of BUM Desa
X_2	= Digitalized key activities
X_3	= Digitalized decision-making
X_4	= Benefits for the village community
X_5	= Digital marketing
X_6	= Key partnership
X_7	= Customer relationship
X_8	= The value of BUM Desa's assets
e	= Error

4 Discussion

4.1 Respondent Characteristics

In this study, the characteristics of the respondents are described through various variables relevant to the management of Village-Owned Enterprises (BUM Desa). Table 2 provides key information regarding BUM Desa rankings, including the age of the BUM Desa, social media usage, and consumer preferences for obtaining information and interacting with BUM Desa businesses. Below is a summary of the characteristics of the BUM Desa sampled in this study:

1. **BUM Desa Rankings**: Of the 153 BUM Desa respondents, the majority were unclassified (norank), with 99 BUM Desa (64.7%) falling into this category. Fourteen BUM Desa (9.2%) were ranked as Pioneer, followed by 13 BUM Desa (8.5%) at the Beginner level, 19 BUM Desa (12.4%) at the Developing level, and 8 BUM Desa (5.2%) classified as Advanced. This indicates that most BUM Desa have not yet been formally accredited, while only a few have reached higher levels of development.
2. **Average BUM Desa Age**: The average age of the BUM Desa is approximately five years, suggesting that many are still in the early stages of development.
3. **Social Media Used to Reach Consumers**: Most BUM Desa (92.8%) use WhatsApp as the primary platform for interacting with consumers. Other social media platforms, such as Facebook and Instagram, are used by a smaller percentage of BUM Desa (4.6% and 2.0%, respectively).
4. **Marketplace Channels Used**: The majority of BUM Desa (73.2%) do not use marketplaces to reach consumers. However, platforms such as Shopee (21.5%) and Tokopedia (2.0%) have begun to be adopted by some BUM Desa respondents.
5. **Product Information Sources**: Most consumers of BUM Desa businesses obtain product or service information through word of mouth (92.2%), while unpaid online media play a minor role (7.8%).
6. **Benefits of Product Information**: Product information is considered beneficial by BUM Desa consumers, primarily by reducing transportation costs (62.1%), providing product descriptions (11.1%), and enhancing product appeal through visualization (20.9%).
7. **Marketing Channel Challenges**: BUM Desa identified several weaknesses in their marketing channels, including a lack of manpower to manage them (33.3%) and limited understanding of how to leverage digital technology (25.5%).
8. **Consumer Interaction Methods**: The majority of BUM Desa interact with customers by offering promotions or discounts (69.3%) to maintain customer loyalty. Other methods, such as giveaways (11.1%) and membership programs (10.5%), are also used, though to a lesser extent.
9. **Response to Customer Complaints**: Most BUM Desa demonstrate a commitment to customer satisfaction, with 98.7% (151 of 153) of respondents addressing complaints or inquiries directly through verbal communication or messaging. This personal and responsive approach helps to build customer trust and loyalty. Only 0.7% (one BUM Desa) use automated systems to respond to inquiries, while another 0.7% do not respond to customer complaints at all. This suggests that direct interaction is perceived as more effective in creating positive consumer experiences, which in turn contributes to the sustainability and growth of BUM Desa.

Table 2. Characteristics of BUM Desa respondents

No	Variable	Count	Percentage (%)
1.	BUM Desa rangking		
	1. No rank	99	64.7

No	Variable	Count	Percentage (%)
	2. Pioneer	14	9.2
	3. Beginner	13	8.5
	4. Developing	19	12.4
	5. Advanced	8	5.2
2.	Average age of BUM Desa (years)	5.34	
3.	Social media used to reach consumers		
	1. Word of mouth	1	0.7
	2. Facebook	7	4.6
	3. Instagram	3	2.0
	4. Whatsapp	142	92.8
4.	Marketplace channels used		
	1. None	112	73.2
	2. Bukalapak	1	0.7
	3. Lazada	4	2.6
	4. Shopee	33	21.5
	5. Tokopedia	3	2.0
5.	Product information sources		
	1. Word of mouth	141	92.2
	2. Unpaid online media	12	7.8
6.	Benefits of product information		
	1. Reducing transportation costs	95	62.1
	2. Informative product descriptions	17	11.1
	3. Visualization and appeal	32	20.9
	4. Other	9	5.9
7.	Marketing channel challenges		
	1. Expensive	27	17.6
	2. Limited understanding	39	25.5
	3. Limited understanding (there is no controlling workforce)	51	33.3
	4. Internet connectivity issues	23	15.0
	5. Other	13	8.6
8.	Consumer Interaction Methods		
	1. Offering Promostions	106	69.3
	2. Giveaways	17	11.1
	3. Membership Programs	16	10.5
	4. Other	14	9.2
9.	Response to Customer Complaints		
	1. Direct Response (verbal, message)	151	98.7
	2. Automated Response	1	0.7
	3. No Response	1	0.7

4.2 Impact of Digitalization on the Development of BUM Desa Management

The multinomial logit regression results were used to evaluate the impact of digitalization on the management and development of BUM Desa. The independent variables tested in this model include age of BUM Desa, digitalized key activities, digitalized decision-making, benefits for the village community, digital marketing, key partnership, customer relationship, and the value of BUM Desa's assets. The model aims to explain the influence of each variable on the ranking of BUM Desa, categorized into Pioneer, Beginner, Developing, and Advanced.

Multinomial logit regression results

Table 3 presents the multinomial logit regression results, detailing the influence of each variable on the BUM Desa ranking categories. These variables show varying levels of statistical significance across the four BUM Desa ranking categories.

1. **Age of BUM Desa:** This variable has a significant negative effect on the No Rank category (p-value = 0.060), indicating that older BUM Desa are less likely to fall into the No Rank category. In the Beginner category, this variable is also significant (p-value = 0.092), suggesting that age contributes to the likelihood of advancing to this category.
2. **Digitalized Key Activities**: This variable shows a positive significant effect in the Pioneer category (Coef. = 1.144, p-value = 0.074), indicating that digitalized key activities are crucial for progressing to the Pioneer stage. However, its effect is not significant in other categories.
3. **Digitalized Decision-Making**: This variable significantly influences both the Pioneer (p-value = 0.063) and Developing (p-value = 0.149) categories. This indicates that BUM Desa's ability to leverage digital technology in decision-making helps improve their ranking, especially in these categories.
4. **Benefits for the Village Community**: This variable does not show any significant effect across all categories, suggesting that while societal benefits are important, they do not directly influence BUM Desa rankings in this model.
5. **Digital Marketing**: In the Pioneer category, digital marketing has a near-significant effect (p-value = 0.138), highlighting its importance in helping BUM Desa progress in the early stages. However, it does not have a significant impact on other categories.
6. **Key Partnership**: This variable has a near-significant effect in the Pioneer category (p-value = 0.100), indicating that strategic partnerships are essential in the early development of BUM Desa. However, its impact is not significant in other categories.
7. **Customer Relationship:** This variable is significant in the Pioneer category (p-value = 0.040), showing that maintaining good customer relationships is crucial for advancing to this category. This underscores the importance of customer interaction in influencing BUM Desa development.
8. **Value of BUM Desa's Assets**: This variable is not significant across all categories, suggesting that while asset value is vital for business sustainability, it does not directly improve BUM Desa rankings in this model.

Table 3. Multinomial logit regression results

Variable	No Ranking		Pioneer Ranking		Beginner Ranking		Developing Ranking	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
Intercept	3.841	0.000 ***	-0.068	0.954	1.757	0.102 *	1.090	0.264
Age of BUM Desa	-0.197	**0.060** **	-0.027	0.835	-0.250	**0.092** **	-0.039	0.730
Digitalized key	0.324	0.509	1.144	**0.074**	-0.271	0.643	0.549	0.322

Variable	No Ranking		Pioneer Ranking		Beginner Ranking		Developing Ranking	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
activities				**				
Digitalized decision-making	-0.073	0.856	0.948	**0.063** **	-0.154	0.760	0.682	**0.149** *
Benefits for the village community	-0.484	0.284	0.528	0.350	-0.204	0.716	-0.013	0.979
Digital marketing	-0.032	0.951	-0.921	**0.138** *	-0.456	0.469	-0.171	0.765
Key partnership	-0.212	0.677	1.023	**0.100** **	-0.126	0.838	-0.345	0.557
Customer relationship	0.289	0.559	-1.290	**0.040** ***	0.816	0.183	0.369	0.532
The value of BUM Desa's assets	0.000	0.471	0.000	0.444	0.000	0.810	0.000	0.726

Sig. ***p ≤ 0.05; **p ≤ 0.10; *p ≤ 0.15

The Goodness of Fit test results for the multinomial logit model are presented in Table 4. The Pearson Chi-Square of 503.418 with a p-value of 0.774 indicates that the model fits the data well. Additionally, the Deviance Chi-Square has a p-value of 1.000, confirming that the model adequately explains the overall data.

Table 4. Goodness of fit test

	Chi-Square	Df	Sig.
Pearson	503.418	560	0.774
Deviance	268.348	560	1.000

Table 5 shows the Pseudo R-Square values, with Cox and Snell at 0.285, Nagelkerke at 0.319, and McFadden at 0.149. These results suggest that the model explains approximately 28.5% to 31.9% of the variance in the data. While these values are moderate, they indicate that the model captures a substantial portion of the variability in BUM Desa rankings based on the included variables.

Table 5. Pseudo r-square test

Cox and Snell	0.285
Nagelkerke	0.319
McFadden	0.149

The MANOVA test results show significant differences between the analyzed groups at a 5% significance level, indicating that digitalization substantially impacts BUM Desa management, particularly in terms of interaction and decision-making.

Table 6. MANOVA test criteria and exact F statistics

	Value	F	Hypothesis df	Error df	Sig.
Pillai's trace	0.308	1.501	32.000	576.000	**0.040***
Wilks' lambda	0.718	1.535	32.000	521.577	**0.032***

Hotelling's trace	0.359	1.567	32.000	558.000	**0.026***
Roy's largest root	0.240	4.315[a]	8.000	144.000	**0.000***

Sig. *p ≤ 0.05

The next test is to examine the results of the likelihood ratio test. The likelihood ratio test is used to determine which independent variables can influence the dependent variable, with a significance level of up to 15% (α level <10%) (see Attachment 2).

5 Conclusion

This study confirms that **digitalization** is a critical driver in the development and management of Village-Owned Enterprises (BUM Desa). By integrating digital tools such as digitalized key activities and decision-making processes, BUM Desa can enhance operational efficiency, foster innovation, and strengthen their competitiveness. This contributes to improved BUM Desa rankings, indicating that digitalization has a significant influence on their growth.

The **age of BUM Desa** also plays an important role in performance. Older BUM Desa tend to achieve higher rankings, demonstrating that operational experience and management maturity are key determinants of success. However, younger BUM Desa should focus on building sustainable operations and investing in capacity-building to enhance their long-term growth potential.

The importance of **direct consumer interaction** cannot be overlooked. BUM Desa that prioritize personal engagement with customers—particularly in addressing inquiries and complaints—tend to enjoy higher levels of customer satisfaction and loyalty. This highlights the crucial role of community relationships in retaining customers and building a positive reputation.

Nevertheless, many BUM Desa have **underutilized digital marketing and e-commerce platforms**. The low adoption of these platforms points to missed opportunities for expanding market reach and increasing product visibility. Encouraging greater use of digital marketing strategies and e-commerce can significantly boost business growth.

Additionally, **strategic partnerships** are essential for sustainable growth, especially for BUM Desa in the early stages of development. Collaborations with suppliers, investors, and other stakeholders provide access to critical resources, knowledge, and networks necessary to overcome operational challenges and ensure long-term sustainability.

Overall, digitalization is not merely a tool for improving operational efficiency but also a key catalyst in driving sustainable rural economic transformation. By strategically leveraging technology and collaborating with various stakeholders, BUM Desa can strengthen their role as engines of economic growth at both local and national levels.

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Attachment

Attachment 1. Operational Variables

`	Factor	Factor loadings
1	**Digitalized key activities (Cronbach's alpha=0.585, KMO-MSA=0.500, Explained variance=71.205)**	
	Our main business activities are related to creating new solutions to customer problems.	0.844
	The key activities of our business are increasingly influenced by information and digital technology development.	0.844
2	**Digitalized decision-making (Cronbach's alpha=0.821, KMO-MSA=0.500, Explained variance=84.816)**	
	The management of the BUM Desa follows certain standards (e.g., ISO or other certifications).	.921
	Modernization of decision-making/operational methods (e.g., having General Shareholders Meetings or using digital tools to assist decision-making).	.921
3	**Digital Marketing (Cronbach's alpha=0.669, KMO-MSA=0.500, Explained variance=75.282)**	
	Our key strength in marketing our products/services is the channels we create.	.753
	The channels (social media, ads, marketplace, or website) we use to reach our customers are currently effective.	.753
4	**Customer Relationship (Cronbach's alpha=0.733, KMO-MSA=0.500, Explained variance=79.055)**	
	Customers feel comfortable with our products or services.	.791
	Customers are willing to pay for various aspects of our offerings.	.791
5	**Key Partnership (Cronbach's alpha=0.793, KMO-MSA=0.500, Explained variance=83.014)**	
	Our supplier and partner network currently enables our business model to function.	.911
	We create alliances/partnerships to acquire resources.	.911
6	**Benefits for the Village Community (Cronbach's alpha=0.847, KMO-MSA=0.685, Explained variance=77.663)**	
	The benefits expected by customers after using our product or service are satisfaction with the quality of the product or service.	.896
	The benefits expected by customers after using our product or service are happiness (becoming happier).	.924
	The benefits expected by customers after using our product or service are improved health (becoming healthier)	.820

Attachment 2. Likehood Ratio Test

Effect	Model Fitting Criteria	Likelihood Ratio Tests		
	-2 Log Likelihood of Reduced Model	Chi-Square	Df	Sig.
Intercept	358.056	65.654	4	0.000
Age of BUMDesa	300.993	8.591	4	**0.072****
Digitalized key activities	299.947	7.545	4	**0.110*****
Digitalized decision-making	306.192	13.790	4	**0.008***
Benefits for the Village Community	301.316	8.914	4	**0.063****
Digital Marketing	298.016	5.614	4	0.230
Key Partnership	302.961	10.559	4	**0.032****
Customer Relationship	307.918	15.516	4	**0.004***
The value of BUM Desa's assets	293.391	0.989	4	0.911

Sig. ***p ≤ 0.05; **p ≤ 0.10; *p ≤ 0.15