

The Role of Government Policy, Technology Adoption, and Rural Entrepreneurship in Enhancing Economic Development in Villages in Indonesia

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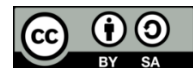
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ABSTRACT

This study examines the roles of government policy, technology adoption, and rural entrepreneurship in enhancing economic development in Indonesian villages. Using a quantitative approach, data were collected from 200 respondents through a structured questionnaire employing a 5-point Likert scale. The data were analyzed using Structural Equation Modeling with Partial Least Squares (SEM-PLS 3) to test the hypothesized relationships. Results indicate that government policy significantly influences technology adoption, rural entrepreneurship, and economic development. Technology adoption positively affects both rural entrepreneurship and economic development, while rural entrepreneurship strongly drives economic development and partially mediates the effect of technology adoption on economic outcomes. These findings highlight the importance of integrated interventions that combine supportive policies, technological empowerment, and entrepreneurial initiatives to foster sustainable rural growth. The study provides practical insights for policymakers, development practitioners, and village leaders aiming to enhance the socio-economic well-being of rural communities.

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1. INTRODUCTION

Background

Rural economic development has long been recognized as a fundamental pillar in achieving inclusive and sustainable national growth, particularly in developing countries such as Indonesia. Villages, which make up the majority of Indonesia's geographical and demographic landscape, play a crucial role in contributing to the overall economy. However, rural areas often face persistent challenges such as limited access to infrastructure, technology, capital,

and entrepreneurial opportunities, which hinder their potential for development. To address these issues, the Indonesian government has introduced various policies aimed at empowering rural communities, promoting entrepreneurship, and accelerating the adoption of technology to strengthen local economies. Historical policies such as land reform and the Green Revolution have shaped rural development, yet gaps in implementation, funding, and management remain [1]. Furthermore, the Law of The Republic of Indonesia Number 6

of 2014 emphasizes village independence across social, cultural, economic, and political dimensions, aiming to strengthen rural economic institutions [2]. In terms of infrastructure and technology, strategies such as improving road and social infrastructure, enhancing UAV applications, and optimizing access to financial resources are identified as beneficial for rural economic development [3]. The BUMDes program encourages rural entrepreneurship by leveraging local resources, though it faces challenges such as regulatory mismatches and lack of qualified human resources [4]. To achieve self-sufficiency, strategies include establishing village development objectives, fostering creativity, innovation, and entrepreneurship, and aligning development models with community characteristics. Village-owned enterprises (BUMDes) thus play a pivotal role in promoting entrepreneurship, though their success depends heavily on stakeholder support and overcoming implementation challenges [4].

The Indonesian government's emphasis on digital transformation in rural areas, through initiatives like Desa Digital and Dana Desa, aims to integrate technology into rural development strategies, fostering innovation and entrepreneurship at the village level. These policies are designed to enhance resource allocation, capacity-building, and infrastructure development, ultimately improving the quality of life and economic prospects in rural communities. The government's approach involves building digital infrastructure, promoting digital literacy, and encouraging the use of ICT to empower rural populations. The development of ICT infrastructure has been prioritized to improve connectivity and accessibility, which is crucial for digital transformation [5], with initiatives such as the Palapa Ring project providing equitable internet connectivity to ensure digital inclusion across remote and urban areas [6]. Alongside this, digital literacy programs equip rural populations with the necessary skills to effectively utilize digital technologies, thereby enhancing competitiveness [5]. Policy implementation is reflected in systems such as

the Village Management and Service Information System (Simpeldesa), which highlight the importance of strategic bureaucratic structures and resource allocation [7]. However, challenges remain, including limited communication and infrastructure that can hinder broader community engagement and service delivery [7]. To address these issues, greater efforts in community outreach and infrastructure support are required to ensure inclusive and sustainable digitalization [7]. Moreover, the "smart village" concept has emerged as a framework for using ICT to improve economic efficiency, competitiveness, and overall quality of life in rural areas, empowering village administrations and communities to manage resources effectively and achieve sustainable development [8].

Technology adoption is considered a key driver in enhancing rural economic productivity and competitiveness, particularly through the use of digital platforms, e-commerce, mobile banking, and agricultural technologies that enable rural communities to access broader markets, improve efficiency, and optimize resource utilization. The integration of digital technologies not only bridges the information gap but also empowers rural entrepreneurs to make informed decisions and expand their business ventures, thereby stimulating innovation and fostering community resilience. Rural entrepreneurship plays a pivotal role in transforming local resources into economic opportunities, creating jobs, reducing poverty, generating income, and improving living standards, yet its success depends largely on the extent to which government policies and technology adoption provide necessary support and opportunities. Digital technologies, such as e-commerce platforms and mobile applications, allow rural entrepreneurs to reach broader markets and enhance operational efficiencies [9], while also providing access to global markets that drive economic growth and create employment opportunities [10]. In Zimbabwe's Gokwe district, for example, digital technologies facilitate networking and interaction with suppliers, distributors, and

customers, thereby enhancing performance and profitability [11]. However, challenges remain as the digital divide—marked by inadequate technological infrastructure and low digital literacy—presents substantial barriers to digital advancement in rural areas, with uneven distribution of infrastructure and lack of digital literacy further hindering adoption and sustainable rural entrepreneurship [10]. Rural entrepreneurs often struggle to identify new opportunities and expand existing markets using digital technologies [11]. To overcome these challenges, supportive policies that encourage digital adoption and investment in digital infrastructure are crucial [9], along with tailored interventions that strengthen entrepreneurial ecosystems and address specific rural needs [12]. Moreover, federal policies, such as those in the United States, have demonstrated how technological adoption can invigorate rural economies by creating new products and improving production processes [13].

Previous studies have highlighted the interrelated roles of policy, technology, and entrepreneurship in shaping rural economic development, where government policies play a pivotal role in supporting rural SMEs and fostering entrepreneurship by providing necessary resources and creating a conducive environment for business growth [14], while programs like the Small Business Innovation Research (SBIR) can improve rural innovation outcomes though their impact on employment and entrepreneurship opportunities may vary between metropolitan and non-metropolitan regions [15]. In terms of technology, renewable energy technologies (RET) are vital for sustainable rural development as they contribute to the advancement of Community Renewable Energy (CRE) projects that support both economic and environmental sustainability [16], and high-tech startup activities in small cities are positively influenced by human capital and proximity to metropolitan areas, emphasizing the importance of technological infrastructure [15]. Meanwhile, entrepreneurship acts as a catalyst for economic, social, and environmental change

in rural communities, with start-up enterprises contributing to job creation, skill development, and the empowerment of local communities, thereby improving quality of life [17], while rural entrepreneurship based on endogenous resources has proven effective in revitalizing socio-economic dynamics and creating job opportunities in peripheral areas, underscoring its importance for rural welfare [18]. Yet, limited empirical research has been conducted to quantitatively assess these relationships within the Indonesian village context, and this study aims to fill that gap by examining the role of government policy, technology adoption, and rural entrepreneurship in enhancing economic development in Indonesian villages.

Research Objective

Rural economic development is an urgent priority for Indonesia, as villages represent the foundation of the nation's socio-economic structure. Despite various programs, many rural areas still face inequality, poverty, and limited access to modern technology. Without immediate interventions through effective policies, accelerated technology adoption, and entrepreneurship strengthening, rural communities risk being left behind in the digital economy era. Strengthening rural economies is therefore essential to achieving inclusive national growth and reducing urban-rural disparities. The novelty of this research lies in its integrative approach that simultaneously examines the roles of government policy, technology adoption, and rural entrepreneurship in enhancing economic development within Indonesian villages using a quantitative method. Unlike previous studies that often focus on single aspects—such as the influence of policy or technology—this study combines these three critical variables and analyzes their interrelationships with empirical evidence through Structural Equation Modeling–Partial Least Squares (SEM-PLS 3). Additionally, the study highlights the mediating role of rural entrepreneurship, offering a deeper understanding of how technological progress and government

initiatives translate into tangible economic growth at the village level.

The objectives of this study are threefold: (1) to analyze the effect of government policy on technology adoption, rural entrepreneurship, and economic development in Indonesian villages; (2) to examine the impact of technology adoption and rural entrepreneurship on rural economic development; and (3) to assess the mediating role of rural entrepreneurship in the relationship between technology adoption and economic development.

2. LITERATURE REVIEW

Government Policy

Government policy plays a pivotal role in rural development in Indonesia by setting the framework for resource allocation, institutional regulation, and socio-economic progress. Programs like Dana Desa and Desa Digital aim to enhance infrastructure, expand digital access, and strengthen local governance, thereby addressing market failures and promoting inclusive growth. Policies that emphasize infrastructure, human capital investment, and financial support can boost entrepreneurship and economic activity while driving technology adoption. The Dana Desa program, for example, seeks to improve public services, reduce poverty, and develop village economies, addressing disparities between villages and integrating them into national development [19]. Infrastructure investments also improve market access, lower transaction costs, and stimulate rural economies [20]. Similarly, the National Village Fund has helped develop local economic potential, preserve natural resources, and build residents' capacity [21] while education and training equip individuals with essential skills [20]. Nonetheless, challenges such as insufficient funding, weak bureaucratic capacity, and complex fund management hinder these programs' effectiveness [1], [19], highlighting the need for stronger management and political commitment to ensure they are well-targeted and efficient [1].

Technology Adoption

The adoption of digital technologies in rural Indonesian economies has been transformative, enhancing innovation, efficiency, and competitiveness through platforms such as e-commerce, mobile banking, and agricultural innovations that enable entrepreneurs to expand markets, improve productivity, and reduce information asymmetry while strengthening access to financial and business networks. Rogers' Diffusion of Innovations theory reinforces this by highlighting the role of perceived usefulness, ease of use, and social influence in technology adoption. In practice, digital banking services, including mobile banking and e-wallets, have improved financial inclusion by lowering credit barriers, increasing financial literacy, and enabling efficient transaction management, thereby fostering resilience and local market growth [22]. Similarly, e-commerce platforms and social media provide opportunities for broader market access and innovative business models [9], though challenges such as weak infrastructure and low digital literacy still hinder full realization. Social influence and relative advantage strongly shape ICT adoption intentions, while perceived ease of use is vital for entrepreneurs without prior experience [23]. Furthermore, digitalization boosts competitiveness by connecting rural entrepreneurs to global markets and supporting sustainable development [10], yet uneven infrastructure distribution and limited literacy remain pressing barriers that must be addressed.

Rural Entrepreneurship

Rural entrepreneurship plays a pivotal role in transforming village economies by leveraging local resources to create marketable products and services, thereby fostering economic growth, job creation, and poverty reduction. In Indonesia, this transformation is supported by microfinance institutions, cooperatives, and digital tools that facilitate broader market participation, making rural entrepreneurship crucial for economic diversification beyond traditional agriculture into sectors like handicrafts, services, and tourism. This diversification stimulates innovation, builds resilience, and

empowers communities to adapt to economic changes, while also providing economic opportunities that promote self-employment and self-sufficiency [24], [25]. Rural entrepreneurship contributes to new economic activities that reduce unemployment and poverty, particularly in rural settings [26], and by encouraging self-reliance, it enhances confidence and satisfaction among residents [25]. Furthermore, it fosters resilience and sustainability through innovative business models and diversification, enabling communities to adapt to social, economic, and environmental changes [27]. However, its sustainability depends on access to financing, training, infrastructure, and institutional support [25], with initiatives like BUMDes (village-owned enterprises) and collaborative participative models in Indonesia serving to optimize stakeholder collaboration and promote local economic growth [26].

Hypothesis Development

Based on the reviewed literature, the following hypotheses are formulated:

H1: Government policy has a positive and significant effect on technology adoption in villages.

H2: Government policy has a positive and significant effect on rural entrepreneurship.

H3: Government policy has a positive and significant effect on economic development in villages.

H4: Technology adoption has a positive and significant effect on rural entrepreneurship.

H5: Technology adoption has a positive and significant effect on economic development in villages.

H6: Rural entrepreneurship has a positive and significant effect on economic development in villages.

H7: Rural entrepreneurship mediates the relationship between technology adoption and economic development in villages.

3. METHODS

Approach

This study employs a quantitative research design to investigate the roles of government policy, technology adoption, and

rural entrepreneurship in enhancing economic development in Indonesian villages, as quantitative methods are suitable for examining relationships between variables and testing hypotheses using statistical tools. The research focuses on measuring both the direct and indirect effects of the independent variables (government policy, technology adoption, and rural entrepreneurship) on the dependent variable (economic development). The study population consists of rural residents, local entrepreneurs, and village officials engaged in economic activities across selected villages in Indonesia, with 200 respondents chosen through purposive sampling based on their experience and knowledge of local economic development initiatives. This sample size is considered sufficient for Structural Equation Modeling with Partial Least Squares (SEM-PLS) analysis, which requires at least 5–10 observations per indicator [28].

Data Collection

Primary data were collected through a structured questionnaire designed to measure perceptions of government policy, technology adoption, rural entrepreneurship, and economic development, using a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) to quantify respondents' opinions on each indicator. The items were adapted from previous studies to ensure content validity, with modifications made to suit the Indonesian rural context. The study covers four main variables with specific indicators: Government Policy (GP), measured by policy support, infrastructure development, financial assistance, and training programs; Technology Adoption (TA), measured by the use of digital platforms, mobile banking, information access, and efficiency improvement; Rural Entrepreneurship (RE), measured by business creation, innovation, market expansion, and income generation; and Economic Development (ED), measured by household income, employment opportunities, infrastructure improvement, and community welfare.

Data Analysis Technique

Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS 3), which enables simultaneous estimation of multiple relationships between variables and is well-suited for complex models, small to medium sample sizes, and non-normal data distributions. The analysis employed a two-step approach: first, Measurement Model Assessment was conducted to test the reliability and validity of indicators, including indicator reliability, internal consistency reliability (Cronbach's alpha and composite reliability), as well as convergent and discriminant validity; second, Structural Model Assessment was performed

to evaluate the hypothesized relationships between variables using path coefficients, t-statistics, and significance levels, while the mediating role of rural entrepreneurship was further examined through bootstrapping procedures with 5,000 resamples.

4. RESULTS AND DISCUSSION

Descriptive Findings

This study involved 200 respondents from various Indonesian villages, including local entrepreneurs, farmers, and village officials. The demographic characteristics are presented in Table 1.

Table 1. Demographic Profile of Respondents (N = 200)

Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	110	55
	Female	90	45
Age	20–29 years	30	15
	30–45 years	96	48
	46–60 years	64	32
	>60 years	10	5
Occupation	Local entrepreneurs	80	40
	Farmers	70	35
	Village officials/others	50	25
Education Level	High school	100	50
	Vocational training	60	30
	Bachelor's degree	30	15
	Others	10	5

Source: Compiled by the author (2025)

The demographic profile of respondents (Table 1) provides useful context for interpreting this study. Of the 200 participants, the gender distribution is relatively balanced, with 55% male and 45% female, showing that both men and women are actively involved in rural economic activities. Most respondents are within the productive age groups of 30–45 years (48%) and 46–60 years (32%), indicating that rural development is largely driven by experienced middle-aged individuals. Younger respondents aged 20–29 years (15%) represent the emerging entrepreneurial generation, while the smaller group over 60 years (5%) highlights older individuals who remain engaged in village economies due to necessity or long-term involvement.

Occupationally, local entrepreneurs form the largest group (40%), underscoring the growing role of entrepreneurship in rural transformation. Farmers account for 35%, reflecting the agrarian foundation of rural Indonesia, while village officials and others (25%) highlight the importance of governance and support. In terms of education, half of the respondents (50%) completed high school and 30% vocational training, indicating a solid base of practical skills, though only 15% hold a bachelor's degree and 5% fall into other categories, reflecting limited higher education access. This profile suggests that while respondents have adequate education to engage in entrepreneurship and adopt technology, gaps in advanced skills may hinder innovation. Overall, the demographic

characteristics reveal a balanced gender composition, dominance of productive age groups, and diversity in education and occupation, shaping the dynamics of rural

entrepreneurship and economic development in Indonesian villages. The descriptive statistics for the main study variables are presented in Table 2.

Table 2. Descriptive Statistics of Main Variables

Variable	Minimum	Maximum	Mean	Standard Deviation (SD)
Government Policy (GP)	2	5	3.85	0.62
Technology Adoption (TA)	2	5	3.72	0.68
Rural Entrepreneurship (RE)	2	5	3.91	0.59
Economic Development (ED)	2	5	3.79	0.61

Source: Compiled by the author (2025)

The descriptive statistics in Table 2 provide an overview of the main variables in this study, showing generally positive perceptions across all dimensions. Government Policy (GP) has a mean of 3.85 (SD = 0.62), indicating that initiatives such as Dana Desa and Desa Digital are seen as supportive of rural development, though improvements in consistency and implementation remain necessary. Technology Adoption (TA) records a slightly lower mean of 3.72 (SD = 0.68), reflecting moderate use of digital platforms, mobile banking, and agricultural innovations, with variability suggesting ongoing disparities in infrastructure and literacy. Rural Entrepreneurship (RE) emerges as the highest-rated variable with a mean of 3.91 (SD = 0.59), highlighting its central role in generating income, creating jobs, and fostering innovation, supported by both traditional and modern practices. Economic

Development (ED) shows a mean of 3.79 (SD = 0.61), indicating perceived progress in income, employment, and welfare, though not yet optimal. Overall, the relatively high mean values across all variables suggest positive developments, while the moderate variability underscores the need for more targeted policies, broader digital access, and stronger entrepreneurial support to achieve equitable and sustainable rural growth.

Measurement Model Results

The measurement model was assessed to ensure indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. All analyses were conducted using SEM-PLS 3.

Indicator Reliability

Indicator reliability was assessed using factor loadings. Items with loadings above 0.70 are considered reliable, and the Variance Inflation Extracted Table 3 shows the loadings for all indicators:

Table 3. Indicator Loadings and VIF

Construct	Indicator	Loading	VIF
Government Policy (GP)	GP1: Policy support	0.823	1.823
	GP2: Infrastructure development	0.855	2.810
	GP3: Financial assistance	0.787	1.927
	GP4: Training programs	0.812	1.281
Technology Adoption (TA)	TA1: Use of digital platforms	0.794	1.584
	TA2: Mobile banking utilization	0.836	1.728
	TA3: Information access	0.773	1.652
	TA4: Efficiency improvement	0.807	1.823
Rural Entrepreneurship (RE)	RE1: Business creation	0.842	2.542

	RE2: Innovation	0.815	1.827
	RE3: Market expansion	0.797	2.018
	RE4: Income generation	0.822	1.891
Economic Development (ED)	ED1: Household income	0.803	2.091
	ED2: Employment opportunities	0.836	1.872
	ED3: Infrastructure improvement	0.789	2.291
	ED4: Community welfare	0.812	2.743

Source: Compiled by the author (2025)

The results in Table 3 demonstrate that all indicators have satisfactory loading values, ranging between 0.773 and 0.855, which exceed the recommended threshold of 0.70 and confirm adequate indicator reliability. For Government Policy (GP), the highest loading is found in infrastructure development (0.855), emphasizing that respondents view infrastructure as the most visible and impactful element of policy support, while financial assistance (0.787) is slightly lower but still valid. In Technology Adoption (TA), mobile banking utilization (0.836) emerges as the strongest indicator, showing that digital financial services are a key driver of technology adoption in rural areas, followed by efficiency improvement (0.807) and digital platform use (0.794). Rural Entrepreneurship (RE) also demonstrates strong loadings, with business creation (0.842) being the most influential factor, reflecting the centrality of new business ventures in driving rural transformation, while innovation (0.815) and income generation (0.822) reinforce entrepreneurship's multidimensional impact. For Economic Development (ED), employment opportunities (0.836) have the highest loading, highlighting the critical role of job creation in improving rural welfare, complemented by household income (0.803) and community welfare (0.812) as strong contributors.

The Variance Inflation Factor (VIF) values, ranging from 1.281 to 2.810, are all well below the threshold of 5, indicating no multicollinearity issues and confirming that each indicator provides unique explanatory power within its construct. Notably, the highest VIF values are found in infrastructure

development (2.810) under GP and community welfare (2.743) under ED, suggesting these indicators share some explanatory overlap with other measures but remain within acceptable limits. Overall, the indicator loadings and VIF results confirm the robustness of the measurement model, with all constructs demonstrating strong reliability and discriminant validity. These findings reinforce the suitability of the selected indicators in capturing the dimensions of government policy, technology adoption, rural entrepreneurship, and economic development in the context of Indonesian villages.

Internal Consistency Reliability

Internal consistency reliability was assessed using Cronbach's alpha and composite reliability (CR), with values above 0.70 considered acceptable. As shown, Government Policy (GP) achieved a Cronbach's alpha of 0.865 and CR of 0.902, Technology Adoption (TA) recorded 0.832 and 0.886, Rural Entrepreneurship (RE) scored 0.874 and 0.912, while Economic Development (ED) obtained 0.858 and 0.891. These results indicate that all constructs meet the reliability threshold and demonstrate high internal consistency, confirming that the indicators used are reliable in measuring their respective latent variables.

Convergent Validity

Convergent validity was evaluated using Average Variance Extracted (AVE), where values above 0.50 indicate that constructs explain more than half of the variance in their indicators. The results show that Government Policy (GP) has an AVE of 0.635, Technology Adoption (TA) 0.612, Rural

Entrepreneurship (RE) 0.655, and Economic Development (ED) 0.629, all exceeding the 0.50 threshold. These findings confirm that each construct demonstrates adequate convergent validity, meaning the indicators effectively represent their respective latent variables.

Table 4. Fornell-Larcker Criterion (Discriminant Validity)

Construct	GP	TA	RE	ED
GP	0.793			
TA	0.485	0.787		
RE	0.458	0.524	0.811	
ED	0.421	0.492	0.543	0.799

Source: Compiled by the author (2025)

The Fornell-Larcker criterion results in Table 4 demonstrate that all constructs meet the requirements for discriminant validity. The square roots of the AVE values, shown on the diagonal (GP = 0.793, TA = 0.787, RE = 0.811, ED = 0.799), are all higher than the correlations between constructs in their respective rows and columns. This indicates that each construct shares more variance with its own indicators than with other constructs, confirming that the constructs are empirically distinct. For instance, Rural Entrepreneurship (RE) shows a strong internal value of 0.811, which is higher than its correlations with Technology Adoption (0.524) and Economic Development (0.543), suggesting that while these relationships are meaningful, RE remains conceptually separate. Similarly, Government Policy (GP) has a value of 0.793, exceeding its correlations with TA (0.485), RE (0.458), and ED (0.421), further confirming discriminant validity.

The relatively moderate correlations between constructs, such as between TA and RE (0.524) or RE and ED (0.543), also highlight important interdependencies in the model while preserving distinctiveness. These

Discriminant Validity

Discriminant validity was confirmed using the Fornell-Larcker criterion, where the square root of AVE for each construct should be greater than its correlation with other constructs. Table 4 shows the results:

values suggest that technology adoption and entrepreneurship are closely linked in driving rural development, and entrepreneurship in turn has a strong connection with economic development. At the same time, the discriminant validity test confirms that government policy, technology adoption, rural entrepreneurship, and economic development are not redundant constructs but rather represent unique dimensions that collectively shape rural economic transformation in Indonesia. Overall, the Fornell-Larcker criterion supports the robustness of the measurement model by validating the distinctiveness of each construct while acknowledging their interrelationships.

Structural Model Results (Path Analysis)

The structural model was assessed to examine the hypothesized relationships among government policy (GP), technology adoption (TA), rural entrepreneurship (RE), and economic development (ED). The analysis was conducted using SEM-PLS 3, evaluating path coefficients (β), t-statistics, and p-values with bootstrapping (5,000 resamples).

Table 5. Structural Model Results

Hypothesis	Path	Original Sample	t-Statistic	p-Value	Result
H1	GP → TA	0.424	6.126	<0.001	Supported
H2	GP → RE	0.352	5.213	<0.001	Supported
H3	GP → ED	0.285	4.057	<0.001	Supported
H4	TA → RE	0.379	5.474	<0.001	Supported
H5	TA → ED	0.331	4.882	<0.001	Supported
H6	RE → ED	0.402	6.547	<0.001	Supported

H7	TA → RE → ED (Mediation)	0.156	3.963	<0.001	Partial Mediation
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Source: Compiled by the author (2025)

The structural model results in Table 7 demonstrate that all proposed hypotheses are strongly supported, with path coefficients significant at $p < 0.001$. Government Policy (GP) shows a significant positive influence on Technology Adoption (TA) ($\beta = 0.424$, $t = 6.126$), Rural Entrepreneurship (RE) ($\beta = 0.352$, $t = 5.213$), and Economic Development (ED) ($\beta = 0.285$, $t = 4.057$), indicating that effective policies in areas such as infrastructure, financial support, and training play a critical role in fostering digital adoption, entrepreneurial activity, and overall rural development. Technology Adoption (TA) also exerts a significant effect on both RE ($\beta = 0.379$, $t = 5.474$) and ED ($\beta = 0.331$, $t = 4.882$), suggesting that digital platforms, mobile banking, and information technologies not only enhance entrepreneurial activity but also contribute directly to economic growth in villages.

Rural Entrepreneurship (RE) emerges as the strongest direct predictor of Economic Development (ED) ($\beta = 0.402$, $t = 6.547$), highlighting the central role of entrepreneurship in creating jobs, generating income, and fostering innovation within rural communities. Furthermore, the mediation test confirms that RE partially mediates the relationship between TA and ED ($\beta = 0.156$, $t = 3.963$), meaning that technology adoption influences economic development both directly and indirectly through its effect on entrepreneurship. This partial mediation underscores the importance of integrating digital technologies into entrepreneurial practices to maximize their economic impact. Overall, the findings validate the conceptual model by demonstrating that government policy, technology adoption, and rural entrepreneurship are interdependent drivers of rural economic development, with entrepreneurship serving as a crucial mechanism through which digital transformation translates into tangible socio-economic benefits for Indonesian villages.

The R^2 values provide insight into the explanatory power of the model, showing

how much variance in the endogenous constructs is accounted for by their predictors. Technology Adoption (TA) has an R^2 value of 0.42, meaning that 42% of its variance is explained by Government Policy (GP). Rural Entrepreneurship (RE) has an R^2 of 0.52, indicating that GP and TA together explain 52% of the variance in entrepreneurial activities. Economic Development (ED) shows the highest explanatory power with an R^2 of 0.60, suggesting that GP, TA, and RE collectively account for 60% of the variance in rural economic development. These values demonstrate that the model has substantial explanatory strength, particularly in linking entrepreneurship and technology adoption with economic outcomes.

In addition to R^2 , the predictive relevance (Q^2) values for all endogenous constructs were found to be above zero, further confirming the model's predictive capability. This indicates that the proposed framework not only explains a significant portion of the variance in the constructs but also has strong predictive accuracy for assessing rural development dynamics. Together, the R^2 and Q^2 results validate the robustness of the structural model, highlighting the critical interplay of government policy, technology adoption, and rural entrepreneurship in shaping economic development within Indonesian villages.

DISCUSSION

Government Policy and Its Impact
The analysis shows that government policy has a significant positive effect on technology adoption, rural entrepreneurship, and economic development, aligning with prior studies that emphasize the role of supportive policies in reducing barriers, providing infrastructure, and enabling communities to engage in entrepreneurial activities. In Indonesia, programs such as Dana Desa and Desa Digital have opened access to resources, training, and financial support, highlighting that effective policy frameworks are essential in stimulating rural growth. At the same time, digital innovation

and infrastructure are transforming rural entrepreneurship through e-commerce platforms and mobile applications that expand market reach and improve efficiency. However, challenges persist in the form of a digital divide, with inadequate infrastructure and low literacy levels still hindering adoption (Nipo et al., 2024). Addressing this requires greater investment in digital infrastructure and targeted educational programs to equip rural entrepreneurs with the skills needed to fully leverage these technologies (Nipo et al., 2024).

Beyond infrastructure, social entrepreneurship has also emerged as a catalyst for socioeconomic transformation in rural Indonesia, complementing government policies by empowering local communities, particularly women, to engage in entrepreneurial activities and drive inclusive growth [29]. Policy frameworks play a central role in fostering entrepreneurial ecosystems by investing in capacity building, seeding opportunities, and providing supportive structures that enhance agribusiness performance [30]. Likewise, financial inclusion through digital banking services, such as mobile banking and e-wallets, further supports rural development by reducing credit barriers and improving financial literacy [22]. To maximize impact, collaborative efforts among policymakers, financial institutions, and community stakeholders are needed to address persistent challenges, including gaps in digital literacy and infrastructure limitations, ensuring that rural communities can fully benefit from technological and entrepreneurial advancements.

Technology Adoption as a Driver of Development

Technology adoption significantly influences both rural entrepreneurship and economic development, as villages that utilize digital platforms, mobile banking, and information technologies benefit from higher efficiency, broader market access, and increased productivity. This aligns with Diffusion of Innovations theory, which highlights how technological adoption accelerates socio-economic progress. The

positive relationship between technology and entrepreneurship shows that digital tools not only streamline business operations but also enable entrepreneurs to innovate and scale their ventures. Technological advancements have revolutionized business models, empowering entrepreneurs to seize opportunities and pursue sustainable growth (Geetha et al., 2024), while the integration of digital technologies has been proven to significantly impact entrepreneurship and digital innovation, especially in developing countries (Kong et al., 2024). Case studies of companies like Tesla and Zoom further illustrate how technology-driven innovation can transform markets and generate broad societal impacts [32].

At the same time, entrepreneurs are motivated by both economic and strategic imperatives to adopt technology. On the economic side, adoption enhances efficiency, reduces costs, and provides a competitive edge [31], while strategically, it supports long-term growth and market expansion [31]. Despite these advantages, challenges such as intense competition, rapid technological obsolescence, and ethical concerns remain obstacles to sustainable progress [32]. Nonetheless, the intersection of technology and entrepreneurship presents limitless opportunities for innovation and economic advancement, fostering a dynamic ecosystem that drives rural development as well as broader national economic growth [33].

Rural Entrepreneurship as a Key Mediator

Rural entrepreneurship has the strongest direct effect on economic development and also serves as a partial mediator in the relationship between technology adoption and economic development, underscoring its role as a crucial mechanism through which technological progress translates into tangible economic outcomes. This finding supports prior research emphasizing that entrepreneurial activity transforms resources and innovations into economic growth while also fostering resilience and social welfare in rural communities. Villages with active entrepreneurial engagement experience higher household income, more employment

opportunities, and improved infrastructure, showing that entrepreneurship directly drives rural transformation. Entrepreneurs are central to economic growth, as small and medium-sized firms provide the majority of new jobs [13], while rural entrepreneurship promotes prosperity through self-employment and self-sufficiency, which improves overall quality of life. High-growth entrepreneurs are particularly impactful, though rural areas often face a shortage of such dynamic actors [13].

Beyond economic benefits, entrepreneurship strengthens long-term resilience and social welfare by diversifying income sources and encouraging innovation [34]. It empowers communities by enhancing self-sufficiency, boosting confidence among residents [25], and fostering stronger social ties, as rural entrepreneurs are deeply embedded in their communities and provide essential products and services [35]. However, rural entrepreneurship continues to face challenges such as limited access to markets, infrastructure, and skilled labor [34]. To overcome these barriers, tailored policies, institutional support, financing access, and training are critical for ensuring the sustainability of rural entrepreneurship [25], [27]. These support systems can help rural entrepreneurs unlock their potential as agents of innovation, resilience, and inclusive development.

5. CONCLUSION

The study confirms that government policy, technology adoption, and rural entrepreneurship play significant roles in promoting economic development in Indonesian villages. Government policies provide the necessary support, infrastructure, and training that facilitate both technology adoption and entrepreneurial activities. Technology adoption enhances efficiency, market access, and productivity, while rural entrepreneurship serves as a key driver of economic growth, partially mediating the

effect of technology on development. The findings underscore the importance of an integrated approach in which policies, technology, and entrepreneurship work synergistically to foster sustainable rural development. Policymakers and development practitioners should prioritize programs that simultaneously address these three dimensions to maximize the socio-economic well-being of rural communities. This research contributes both theoretically and practically by offering a model for understanding and promoting rural economic development in developing countries like Indonesia.

Implications for Economic Development

The results demonstrate that integrated approaches—linking policy support, technology adoption, and entrepreneurship—are essential for achieving sustainable rural economic development. Government policies alone are insufficient; their effectiveness is amplified when combined with technological tools that enhance entrepreneurial capacity. Likewise, technology adoption achieves its greatest impact when rural entrepreneurs are supported with skills, networks, and resources. The synergy among these three factors drives measurable improvements in household income, community welfare, and local infrastructure, supporting Indonesia's broader goal of inclusive and equitable development.

Theoretical and Practical Contributions

The study contributes theoretically by validating a comprehensive model that integrates policy, technology, and entrepreneurship in explaining rural economic development. Practically, it provides policymakers with evidence that targeted interventions in these three areas can significantly enhance village economies. Development practitioners and local leaders can utilize these insights to design programs that simultaneously address policy support, technological empowerment, and entrepreneurial capacity building.

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