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Forging Digital Pathways to Prosperity: A Mixed-Methods Inquiry into Digital Literacy, Community Entrepreneurship, and Sustainable Development Goal Attainment in Rural Indonesia

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A B S T R A C T

The proliferation of digital technology presents a monumental opportunity for economic development, yet its benefits remain unevenly distributed, particularly in the rural regions of developing nations like Indonesia. This study investigates the critical role of digital literacy as a catalyst for community entrepreneurship, and its subsequent impact on achieving Sustainable Development Goal 1 (No Poverty) and Goal 8 (Decent Work and Economic Growth). A sequential explanatory mixed-methods design was employed across three diverse rural regencies in Indonesia. The initial quantitative phase involved a multi-stage cluster survey of 525 rural entrepreneurs, with data analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) to test hypothesized relationships. The subsequent qualitative phase comprised 30 in-depth, semi-structured interviews with entrepreneurs and community leaders, selected purposively from the quantitative sample. Interview data were analyzed using rigorous thematic analysis to explain and enrich the statistical findings. The PLS-SEM analysis revealed that digital literacy has a significant, positive direct effect on both entrepreneurial intention (β=0.451, $p<0.001$) and entrepreneurial performance (β=0.382, $p<0.001$). Entrepreneurial performance, in turn, was a strong predictor of progress toward SDG 1 (β=0.523, $p<0.001$) and SDG 8 (β=0.610, $p<0.001$). Qualitative findings identified three core mechanisms facilitating these relationships: (1) the use of digital platforms as a gateway to expanded markets, (2) the vital role of informal, peer-to-peer social networks in digital skill acquisition, and (3) the translation of individual entrepreneurial success into community-wide economic benefits through local job creation and value chain development. In conclusion, digital literacy is a foundational capability that directly empowers rural entrepreneurs, driving local economic performance and accelerating progress toward key SDGs. These findings underscore the necessity of moving beyond infrastructure-centric policies to holistic strategies that cultivate digital skills through community-based learning and support the integration of digital tools into local enterprises.

1. Introduction

The 21st century is defined by the pervasive influence of the digital revolution, a force that has fundamentally reconfigured economic structures, social interactions, and pathways to development. The rapid expansion of mobile technology, internet connectivity, and digital platforms has unlocked unprecedented opportunities for innovation, efficiency, and inclusion. Concurrently, the international community has committed to the 2030 Agenda for Sustainable Development, a comprehensive framework centered around 17 Sustainable Development Goals (SDGs) that aim to eradicate poverty, protect the planet, and ensure

prosperity for all. Within this global context, the intersection of digitalization and sustainable development has emerged as a critical area of inquiry and policy focus. Specifically, SDG 1 (No Poverty) and SDG 8 (Decent Work and Economic Growth) are profoundly linked to the capacity of individuals and communities to leverage digital tools for economic empowerment and wealth creation.[1-3]

Indonesia, as the largest economy in Southeast Asia and a nation characterized by significant geographic and demographic diversity, represents a compelling case study of this dynamic. The country has experienced a meteoric rise in its digital economy, which is projected to reach a gross merchandise value of hundreds of billions of dollars within the next decade. This growth, however, has been overwhelmingly concentrated in urban centers, creating a stark digital and economic divide between metropolitan hubs and the vast rural archipelago where a significant portion of the population resides. For these rural communities, which form the backbone of the nation's agricultural and artisanal economies, the promise of digital prosperity often remains just out of reach. The primary challenge is not merely the absence of physical infrastructure, but a deficit in the human capabilities required to transform digital access into tangible economic outcomes—a capability best encapsulated by the concept of digital literacy.[4-6]

Rural development has traditionally been a cornerstone of national policy in Indonesia, aimed at alleviating poverty and reducing regional inequality. A pivotal strategy in this endeavor is the promotion of community-based entrepreneurship. Unlike large-scale industrial enterprises, community entrepreneurship is rooted in local contexts, utilizes local resources, and is often driven by collective action and shared social capital. These micro, small, and medium enterprises (MSMEs) are critical engines of rural economies, providing employment, generating household income, and fostering a sense of local self-reliance. They are instrumental in achieving SDG 8 by promoting sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. Furthermore, by creating localized economic opportunities, these enterprises directly contribute to SDG 1 by lifting households out of poverty and building economic resilience against shocks.[7-9]

However, rural entrepreneurs in Indonesia face a myriad of systemic challenges, including limited access to markets, finance, and information. Geographic isolation often restricts their customer base to the immediate locality, while a lack of market intelligence prevents them from adapting their products and prices to broader demand. Traditional business models are often constrained by these factors, leading to stagnation and limited growth potential. It is precisely these barriers that digitalization has the potential to dismantle. Digital platforms can connect rural producers to national and even international markets, mobile financial services can facilitate access to capital, and the internet provides a limitless repository of information on production techniques, design trends, and business management strategies. The critical question, therefore, is what enables rural entrepreneurs to effectively harness this potential.[10,11]

Digital literacy is a multidimensional concept that extends far beyond the rudimentary ability to use a computer or smartphone. It encompasses a spectrum of competencies, including the technical skills to operate digital devices, the cognitive ability to find, evaluate, and synthesize online information (information literacy), the social skills to communicate and collaborate effectively in digital spaces (communication literacy), and the creative capacity to produce digital content and innovate using digital tools. In the context of entrepreneurship, digital literacy is not an end in itself, but a critical enabler of business functions. An entrepreneur with high digital literacy can conduct market research online, use social media for marketing and customer engagement, manage inventory and finances through mobile applications, and access e-commerce platforms to sell their products to a wider audience.[12]

Despite its importance, there remains a significant research gap in understanding the precise mechanisms through which digital literacy influences entrepreneurial outcomes and, by extension, progress on the SDGs in specific socio-cultural contexts. Many studies have established a general positive correlation between ICT adoption and economic growth at a macro level. Others have provided rich, but often localized, qualitative accounts of digital entrepreneurship.[13] However, few studies have employed a mixed-methods approach to systematically model the causal pathways from digital literacy to entrepreneurial performance and then to SDG-related impacts, while simultaneously exploring the lived experiences and contextual factors that shape these pathways. Existing quantitative models often treat digital literacy as a monolithic variable, failing to capture its nuanced dimensions, while qualitative studies often lack the generalizability to inform national-level policy. This leaves a critical knowledge void: we understand that digitalization matters for rural development, but we lack a comprehensive, empirically-grounded understanding of how and why it matters for the rural entrepreneur.

This study aims to address this critical research gap by providing a comprehensive and nuanced analysis of the relationship between digital literacy, community entrepreneurship, and the acceleration of SDGs 1 and 8 in rural Indonesia. The primary objective is to investigate the causal pathways linking an entrepreneur's digital literacy to their business performance and its resultant impact on poverty reduction and local economic growth.

The novelty of this research lies in its methodological integration and theoretical depth. We employ a sequential explanatory mixed-methods design, a powerful approach that is uniquely suited to this research problem. This design allows us to first establish and validate statistical relationships across a large, representative sample through robust quantitative modeling (PLS-SEM), and then to delve deeper with qualitative inquiry to uncover the rich, context-specific mechanisms, processes, and barriers that underpin these statistical results. This integration moves beyond simple correlation to provide a holistic and actionable explanation of the phenomenon. Furthermore, the study contributes novel theoretical insights by framing digital literacy not merely as a technical skill, but as a fundamental capability in the tradition of Sen's Capabilities Approach, which expands the real freedoms of individuals to pursue economic opportunities and improve their well-being. By combining a robust quantitative model with deep qualitative exploration, this research provides an unparalleled, multi-faceted understanding of how to forge digital pathways to prosperity in the rural communities that stand to gain the most from the digital age.

2. Methods

To achieve a comprehensive understanding of the complex interplay between digital literacy, entrepreneurship, and SDG attainment, this study employed a sequential explanatory mixed-methods design. This two-phase approach is recognized for its strength in allowing researchers to first identify significant quantitative trends and relationships within a population and subsequently explore the underlying reasons for those results in greater detail through qualitative inquiry. (1) Phase 1 (Quantitative): In the first phase, a cross-sectional survey was administered to a large sample of rural entrepreneurs. The objective was to test a hypothesized structural model that posits causal relationships between digital literacy, entrepreneurial intention, entrepreneurial performance, and SDG-related outcomes. This phase provided the statistical foundation of the study; (2) Phase 2 (Qualitative): The second phase involved conducting in-depth, semi-structured interviews with a purposively selected sub-sample of participants from the first phase. The primary objective of this phase was to explain, interpret, and enrich the statistical findings from Phase 1. It focused on understanding the lived experiences, perceptions, and contextual factors that influence how digital literacy is acquired and utilized by rural entrepreneurs. The integration of these two

phases occurred at the interpretation stage, where the qualitative findings were used to provide a nuanced, mechanistic explanation for the statistically significant (or non-significant) relationships identified in the quantitative model. This integrated approach ensures both the generalizability of the findings and a deep, contextualized understanding of the phenomenon.

The research was conducted between January 2024 and December 2024 in three rural regencies (*Kabupaten*) in Indonesia. These locations were purposively selected to represent a diversity of socio-economic contexts, primary economic activities, and levels of digital infrastructure development, thereby enhancing the external validity of the findings. The selected regencies were: (1) Kabupaten Banyuasin, South Sumatra: A region characterized by agriculture and aquaculture, with developing digital infrastructure; (2) Kabupaten Lombok Timur, West Nusa Tenggara: A region with a strong focus on tourism, handicrafts, and agriculture, facing challenges in last-mile connectivity; (3) Kabupaten Minahasa, North Sulawesi: A region with a robust agricultural economy (horticulture and plantations) and relatively better digital infrastructure compared to the other two sites. The target population for the study was individuals residing in these rural regencies who were actively engaged in operating a micro or small enterprise for at least one year. This included farmers selling value-added products, local artisans, small-scale retailers, and providers of local services.

A multi-stage cluster sampling technique was employed for the quantitative phase. First, within each of the three regencies, five sub-districts (*Kecamatan*) were randomly selected. Second, within each selected sub-district, two villages (*Desa*) were randomly chosen. Finally, within each village, a systematic random sampling approach was used to select households, from which eligible entrepreneurs were identified through a screening questionnaire.

The required sample size was determined using a power analysis for PLS-SEM, based on an anticipated effect size (f2) of 0.15, a statistical power of 0.80, and a significance level (α) of 0.05. The analysis indicated a minimum required sample of 350 participants. To account for potential non-response and data cleaning, a target sample size of 600 was set. After data collection and screening for completeness and outliers, a final valid sample of 525 entrepreneurs was obtained for analysis.

The primary data collection instrument was a structured questionnaire, developed based on a comprehensive review of existing literature and validated scales. The questionnaire was translated from English to Bahasa Indonesia and then back-translated by independent bilingual experts to ensure conceptual and linguistic equivalence. It consisted of five main sections: (1) Demographics: Collected information on age, gender, education level, household size, and primary business sector; (2) Digital Literacy (DL): Measured using a 20-item scale adapted from Ng's study, assessing cognitive, technical, and social-emotional dimensions of digital competence on a 5-point Likert scale (1=Strongly Disagree, 5=Strongly Agree); (3) Entrepreneurial Intention (EI): Measured using a 6-item scale adapted from Liñán et al., assessing the individual's motivation and readiness to pursue entrepreneurial activities; (4) Entrepreneurial Performance (EP): Measured using a composite index of self-reported metrics, including annual revenue growth, profitability increase over the past two years, and number of new employees hired; (5) SDG Impact: Measured through two constructs representing perceived contributions to SDG 1 (Poverty Reduction) and SDG 8 (Economic Growth), using items developed for this study that assessed changes in household income stability, asset accumulation, local job creation, and use of local suppliers. A pilot test was conducted with 30 rural entrepreneurs in a non-participating village to assess the clarity, relevance, and reliability of the questionnaire items, leading to minor refinements in wording.

The quantitative data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0 software. PLS-SEM was chosen for several reasons: it is robust with non-normally distributed data, effective with complex

predictive models, and well-suited for studies that aim to test and develop theory. The analysis was conducted in two stages as recommended by Hair et al.; (1) Assessment of the Measurement Model: This stage evaluated the reliability and validity of the constructs. Internal consistency was assessed using Cronbach's Alpha and Composite Reliability (CR), with a threshold of 0.70. Convergent validity was assessed using the Average Variance Extracted (AVE), with a threshold of 0.50. Discriminant validity was established using the Heterotrait-Monotrait (HTMT) ratio of correlations, with a strict criterion of 0.85; (2) Assessment of the Structural Model: This stage tested the hypothesized relationships between the constructs. Path coefficients (β), their significance (t-values and p-values) obtained through a bootstrapping procedure with 5,000 resamples, and the coefficient of determination (R^2) for endogenous variables were examined. The model's predictive relevance was assessed using the Stone-Geisser's Q^2 value.

Following the analysis of the quantitative data, participants for the qualitative phase were selected using a purposive sampling strategy. The goal was to select information-rich cases that could best help explain the statistical results. Participants were selected based on their survey responses, creating four distinct groups: (a) high digital literacy and high entrepreneurial performance, (b) high digital literacy and low entrepreneurial performance, (c) low digital literacy and high entrepreneurial performance, and (d) low digital literacy and low entrepreneurial performance. This "extreme case" sampling allowed for a detailed exploration of the factors differentiating success.

A total of 30 participants were interviewed, comprising 22 entrepreneurs and 8 community leaders (village heads, heads of local cooperatives) to provide a broader community perspective. In-depth, semi-structured interviews were the primary method of data collection. Each interview lasted approximately 60-90 minutes, was conducted in Bahasa Indonesia, audio-recorded with consent, and transcribed verbatim. The interview protocol was designed to be flexible, focusing on key themes from the quantitative phase, such as how digital skills were acquired, specific ways technology was used in business operations, perceived challenges and enablers, and the observed impact on their family and community.

The qualitative data were analyzed using thematic analysis, following the six-phase framework outlined by Braun et al. The process was systematic and rigorous: (1) Familiarization: The research team read and re-read the transcripts to immerse themselves in the data; (2) Initial Coding: Initial codes were generated from the data, identifying interesting features relevant to the research questions; (3) Searching for Themes: Codes were collated into potential themes, gathering all relevant data under each theme; (4) Reviewing Themes: The potential themes were reviewed and refined, checking if they worked in relation to the coded extracts and the entire dataset; (5) Defining and Naming Themes: Once finalized, themes were clearly defined and named, and a detailed analysis of each was written; (6) Producing the Report: The final analysis was written into a coherent narrative, using vivid participant quotes to illustrate the themes. The software NVivo 12 was used to facilitate data management, coding, and theme development, enhancing the transparency and rigor of the analysis.

This study was conducted in strict adherence to ethical principles for research involving human subjects. Prior to data collection, approval was obtained from the Institutional Research Ethics Committee of the CMHC Research Center, Indonesia. All participants were provided with a detailed information sheet explaining the purpose of the study, the voluntary nature of their participation, and the procedures for ensuring confidentiality and anonymity. Written informed consent was obtained from all participants before the survey or interview commenced. All data were anonymized, and personal identifiers were removed from transcripts and datasets to protect participant privacy.

3. Results and discussion

This section presents the findings of the study, organized according to the two-phase mixed-methods design. First, the results of the quantitative analysis (PLS-SEM) are detailed, followed by the rich thematic findings from the qualitative interviews that serve to explain and elaborate upon the statistical model.

The demographic profile of the 525 rural entrepreneurs surveyed is summarized in Table 1. The sample was relatively balanced in terms of gender, with 54.1% male and 45.9% female participants. The majority of entrepreneurs were between the ages of 31 and 50 (62.3%), had completed at least a high school education (71.2%), and operated primarily in the agriculture/agribusiness sector (40.4%).

Table 1. Demographic characteristics of survey respondents (N=525)

Characteristic	Category	Frequency	Percentage (%)
Gender	Male	284	54.1%
	Female	241	45.9%
Age Group	18-30	98	18.7%
	31-40	171	32.6%
	41-50	156	29.7%
	>50	100	19.0%
Education	No formal/Primary	52	9.9%
	Junior High School	99	18.9%
	Senior High School	258	49.1%
	Diploma/University	116	22.1%
Business Sector	Agriculture/Agribusiness	212	40.4%
	Retail/Trade	142	27.0%
	Handicrafts/Manufacturing	111	21.1%
	Services (tourism-related)	60	11.5%

The reliability and validity of the measurement model were rigorously assessed. As shown in Table 2, all constructs demonstrated high levels of internal consistency, with Cronbach's Alpha and Composite Reliability (CR) values exceeding the recommended threshold of 0.70. Convergent validity was confirmed, as the Average Variance Extracted (AVE) for each construct was above the 0.50 benchmark, indicating

that each construct explains more than half of the variance of its indicators. Discriminant validity was established using the HTMT ratio criterion. The HTMT values for all pairs of constructs were below the conservative threshold of 0.85, confirming that each construct is empirically distinct from the others in the model. This comprehensive assessment confirmed that the measurement model was robust, reliable, and valid, providing a sound basis for evaluating the structural model.

Table 2. Assessment of measurement model: reliability and convergent validity

Construct	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)
Digital Literacy (DL)	0.915	0.932	0.631
Entrepreneurial Intention (EI)	0.887	0.914	0.680
Entrepreneurial Performance (EP)	0.899	0.925	0.712
SDG 1 Impact (Poverty)	0.903	0.929	0.724
SDG 8 Impact (Growth)	0.921	0.941	0.760

Note: Thresholds for good model fit are α > 0.70, CR > 0.70, and AVE > 0.50. All constructs meet these criteria.

The structural model was assessed to test the hypothesized relationships. The results, detailed in Table 3 and visualized in Figure 1, provide strong support for all proposed hypotheses. The model's explanatory power was substantial, explaining 41.5% of the variance in Entrepreneurial Performance (R2=0.415), 43.8% of the variance in SDG 1 Impact (R2=0.438), and 52.1% of the variance in SDG 8 Impact (R2=0.521). The model also demonstrated significant predictive relevance, with all values being considerably larger than zero.

Table 3. Results of hypothesis testing (structural model path coefficients)

Hypothesis	Path	Path Coefficient (β)	T Statistics	P Value	Decision
H1	DL → EI	0.451	10.231	<0.001	✓ Supported
H2	DL → EP	0.382	8.915	<0.001	✓ Supported
H3	EI → EP	0.297	6.542	<0.001	✓ Supported
H4	EP → SDG 1	0.523	12.876	<0.001	✓ Supported
H5	EP → SDG 8	0.610	15.602	<0.001	✓ Supported

Note: All path coefficients are significant at p < 0.001. DL = Digital Literacy, EI = Entrepreneurial Intention, EP = Entrepreneurial Performance.

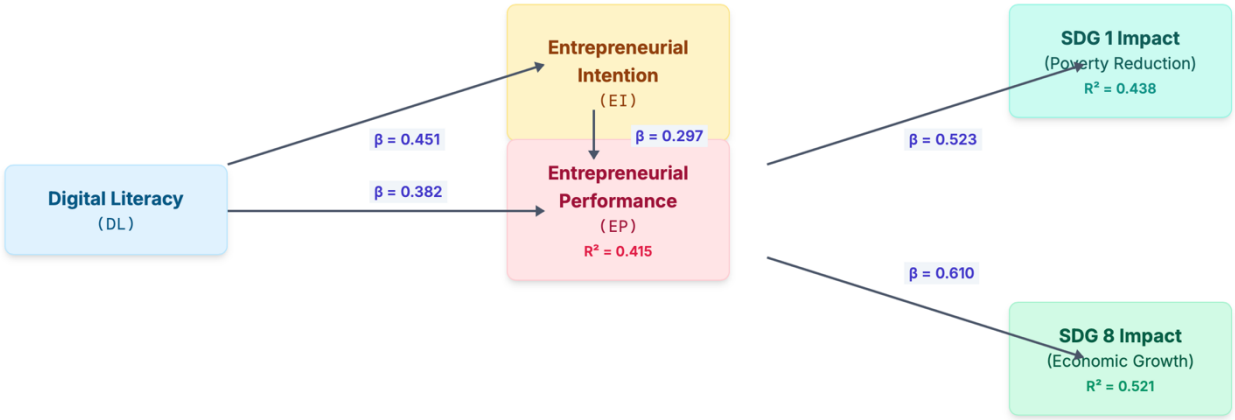

Figure 1. Validated structural model. The diagram shows Digital Literacy (DL) as an antecedent. DL has direct paths to Entrepreneurial Intention (EI) and Entrepreneurial Performance (EP). EI also has a path to EP. EP then has direct paths to SDG 1 Impact and SDG 8 Impact. All paths show positive and significant coefficients.

The key findings from the structural model are as follows: (1) H1: Digital Literacy had a strong, significant positive effect on Entrepreneurial Intention (β=0.451, p<0.001), indicating that higher levels of digital competence strongly correlate with an individual's motivation to engage in and expand their entrepreneurial activities; (2) H2: Digital Literacy also had a significant direct positive effect on Entrepreneurial Performance (β=0.382, p<0.001), demonstrating that digital skills translate directly into improved business outcomes; (3) H3: Entrepreneurial Intention was found to be a significant predictor of Entrepreneurial Performance (β=0.297, p<0.001). This suggests that the positive effect of digital literacy on performance is partially mediated by the enhanced intention and confidence it instills in entrepreneurs; (5) H4 & H5: Most critically, Entrepreneurial Performance was shown to be a powerful predictor of both SDG 1 Impact (Poverty Reduction) (β=0.523, p<0.001) and SDG 8 Impact (Economic Growth) (β=0.610, p<0.001). This provides strong quantitative evidence that the success of rural enterprises serves as a primary vehicle for achieving broader sustainable development outcomes at the community level. The thematic analysis of the 30 in-depth interviews yielded four major themes that explain and add depth to the quantitative findings. These themes illuminate the mechanisms through which digital literacy is acquired, operationalized, and translated into socio-economic impact.

Theme 1: The smartphone as a "toko digital" (digital shop): a gateway to expanded markets

This theme directly explains the strong statistical link between digital literacy and entrepreneurial performance. Participants consistently described their smartphones not just as communication devices, but as powerful business tools that effectively functioned as a "digital shop." Entrepreneurs with higher digital literacy were able to overcome the physical isolation of their rural locations by leveraging digital platforms.

A coffee farmer and processor from Minahasa (high DL, high EP) explained:

"*Before, I could only sell my roasted beans at the local market. My price was low because everyone else was selling coffee too. After my son taught me how to use Instagram and Facebook, my world changed. I posted photos of the farm, the beans, the process. Suddenly, people from Jakarta, even from Singapore, were messaging me. I learned to package my coffee nicely and sell it on Tokopedia. My income has tripled. My phone is now my most important shop.*"

This quote illustrates the mechanism: digital literacy (specifically, skills in social media marketing and e-commerce) directly expands market access, leading to increased sales and higher income—key components of entrepreneurial performance.

Conversely, a weaver from Lombok (low DL, low EP) lamented:

"I hear that others sell their fabrics online for a good price. I have a smartphone, but I only know how to use WhatsApp to call my family. I don't know how to take good photos or post them online. It feels too complicated. So I wait for tourists to come to the village, but sometimes they don't come for weeks."

This highlights that mere access to technology is insufficient; it is the literacy to use it strategically that drives performance.

Theme 2: "Belajar dari Teman" (learning from friends): the primacy of informal social networks in skill acquisition

This theme provides a crucial explanation for how digital literacy is developed in rural contexts. The quantitative model treated digital literacy as an individual attribute, but the qualitative data revealed it is often a socially constructed and shared capability. Overwhelmingly, participants reported that they acquired their digital skills not through formal training programs, but through informal, peer-to-peer learning within their social networks.

A young snack producer from Banyuasin (high DL, high EP) stated:

"There was no course. My friends and I, we have a WhatsApp group. If someone learns something new, like how to make a promotional video with a video-editing application, they share it in the group. We teach each other. My friend taught me how to see what's trending on TikTok, so I made a video of my kemplang [fish crackers] and it got many views. We learn by trying and by asking friends."

This "learning from friends" mechanism is vital. It is agile, context-specific, and built on trust. Community leaders also recognized this, with one village head noting:

"The government programs for digital training are often too rigid, too theoretical. The real learning happens in the 'warung kopi' [coffee stall] where the young people gather and show each other things on their phones. The most effective way to help is to support these community champions, the ones who are good with technology and willing to teach their neighbors."

This theme suggests that policies aimed at enhancing digital literacy should focus on facilitating and amplifying these existing informal learning ecosystems rather than solely relying on top-down training initiatives.

Theme 3: Navigating the digital obstacles: the persistent realities of infrastructure and affordability

While the overall story was one of empowerment, this theme captures the challenges that temper the positive impacts of digitalization and explain the variance in outcomes. Even for digitally literate entrepreneurs, performance was often constrained by factors beyond their control, primarily poor infrastructure and high costs. This provides context for why some participants with high digital literacy still exhibited lower-than-expected performance.

An artisan from Lombok (high DL, low EP) expressed her frustration:

"I know how to sell on the marketplace. I have my products listed. But when a customer from another island orders, the shipping cost is sometimes more expensive than the product itself. Also, the internet signal in my village is very unstable. Sometimes I cannot upload new photos for days, or I miss a customer's message. It is a constant struggle."

Another participant, a vegetable farmer, pointed to the cost of data:

"To be active online, you need to buy a data package continuously. When sales are slow, it feels like a heavy expense. I have to choose between buying data to promote my vegetables or buying fertilizer. It's a difficult choice."

These quotes illuminate the crucial mediating role of the enabling environment. Digital literacy and entrepreneurial intention are necessary, but not sufficient. Without reliable, affordable connectivity and supportive logistics, the potential of digital entrepreneurship cannot be fully realized.

Theme 4: From my pocket to our village: the multiplier effect on community well-being

This final theme provides a powerful, human-

centered explanation for the strong statistical link between entrepreneurial performance and the SDG impacts. Participants articulated a clear sense of how their individual business success generated a positive ripple effect throughout their community, directly contributing to poverty reduction (SDG 1) and local economic growth (SDG 8).

A successful homestay owner in Lombok (high DL, high EP) described this multiplier effect:

"*Because I can get bookings online through online travel agencies, my rooms are almost always full. Now, I have been able to hire two women from the village to help with cleaning and cooking. I buy all my vegetables from the farmer next door, the fish from the local fisherman, and the coffee from the cooperative down the road. My success is not just my own; it helps many families here."*

This quote perfectly illustrates the mechanism: a successful digitally-enabled enterprise creates direct employment (SDG 8) and funnels income into the local economy by sourcing from other local producers, which in turn raises incomes for other households (SDG 1).

A community leader from Minahasa reinforced this view:

"When one or two entrepreneurs become successful using digital tools, it inspires others. More importantly, they start hiring the youth who might otherwise leave for the city. The money they earn is spent here, in our village. It creates a cycle of growth. We are seeing fewer families struggling to make ends meet because of these small businesses."

This theme confirms that community entrepreneurship, when amplified by digital literacy, acts as a powerful, bottom-up engine for achieving sustainable development, creating a more resilient and prosperous local economy.

This study set out to investigate the pathways through which digital literacy influences community entrepreneurship and the attainment of SDGs 1 and 8 in rural Indonesia. The integrated findings from our mixed-methods approach provide a robust and multi-layered understanding of this dynamic, revealing not only the statistical significance of these relationships but also the underlying mechanisms that drive them. This discussion synthesizes the quantitative and qualitative results, links them to broader theoretical frameworks, and outlines the critical implications for policy and practice.

The central finding of this study is the powerful, positive effect of digital literacy on entrepreneurial performance. The quantitative model established this link with high statistical significance (β=0.382), and the qualitative findings provided a vivid picture of the mechanism at work. Our results strongly support framing digital literacy through the lens of Amartya Sen's Capabilities Approach (16). According to this framework, development should be understood not just as an increase in income, but as an expansion of human "capabilities"—the real freedoms and opportunities people have to achieve outcomes they value.[10-12]

Our research demonstrates that digital literacy functions as a meta-capability in the rural entrepreneurial context. It is not merely a technical skill but a tool that fundamentally expands an entrepreneur's "capability set." Specifically, it enhances three critical freedoms: (1) Freedom of Access to Markets: As articulated in Theme 1 ("The Smartphone as a 'Toko Digital'"), digital literacy dismantles the geographic barriers that have historically constrained rural enterprises. It provides the capability to access a national, or even global, customer base, transforming a subsistence-level operation into a growth-oriented business. This aligns with previous research who argue that digital platforms are key to integrating rural producers into larger value chains; (1) Freedom of Access to Information: Digitally literate entrepreneurs can access real-time information on market prices, consumer trends, new production techniques, and competitor activities. This reduces information asymmetry and empowers them to make more strategic business decisions, a factor known to be critical for MSME competitiveness; (2) Freedom of Access to Networks: Digital tools facilitate

communication and collaboration with suppliers, partners, and other entrepreneurs. The qualitative finding on the importance of WhatsApp groups for peer learning is a testament to this, showing how digital networks enhance social capital and foster collective innovation. By viewing digital literacy through this lens, we understand that its impact on performance is not automatic; it is mediated by how it empowers entrepreneurs to convert resources (their skills, their products) into valued functionings (running a successful business, earning a higher income).[13-15]

A significant contribution of this study is the elucidation of how digital literacy is acquired and diffused in rural settings. While our quantitative model measured digital literacy at the individual level, our qualitative findings (Theme 2) revealed that the learning process is deeply socially embedded. The "Belajar dari Teman" (learning from friends) phenomenon highlights the inadequacy of viewing digital inclusion as a purely technical or individualistic challenge. This resonates with the Diffusion of Innovations Theory, which posits that the adoption of new ideas and technologies is heavily influenced by social networks and peer communication.[16-18]

Our findings suggest that in rural Indonesian communities, informal peer networks are more effective channels for diffusing digital skills than formal, top-down training programs. These networks are built on trust, use contextually relevant language and examples, and provide ongoing support. This insight has profound policy implications. Rather than investing solely in standardized, one-off training modules, development agencies and governments should focus on a "train-the-trainer" model that identifies and empowers local "digital champions." Supporting these individuals to create and lead peer-learning groups could be a far more scalable and sustainable strategy for building community-wide digital capability. This also aligns with findings from studies in other developing regions, which emphasize the role of social learning in technology adoption among smallholder farmers and artisans.[19,20]

The study provides compelling evidence that community entrepreneurship serves as the critical bridge linking individual digital capabilities to community-level SDG attainment. The strong path coefficients from Entrepreneurial Performance to both SDG 1 Impact (β=0.523) and SDG 8 Impact (β=0.610) are statistically robust. The qualitative findings (Theme 4) brought this statistical relationship to life, illustrating the tangible "multiplier effect" within the local economy.

The mechanism is twofold. First, successful enterprises create direct employment, offering "decent work" (SDG 8) to community members, particularly youth, which reduces out-migration to urban centers. Second, these businesses create indirect economic benefits by sourcing raw materials, services, and labor locally. As described by the homestay owner who bought produce from her neighbors, this process injects capital into the local economy and strengthens interdependent value chains, raising incomes across multiple households and contributing directly to poverty reduction (SDG 1). This "bottom-up" development model, fueled by digitally-empowered local entrepreneurs, presents a powerful alternative or complement to traditional top-down aid and welfare programs. It fosters self-reliance, builds local economic resilience, and ensures that the benefits of growth are more inclusively distributed within the community. This finding reinforces the arguments of scholars who champion entrepreneurship as a primary driver of sustainable development.[18]

While our findings paint an optimistic picture, it is crucial to acknowledge the constraints identified in Theme 3. The challenges of unreliable internet infrastructure, high data costs, and logistical hurdles are significant barriers that can stifle the potential of even the most digitally savvy entrepreneur. This underscores a critical point: digital literacy and infrastructure are complements, not substitutes. One without the other is insufficient. Our findings caution against a policy approach that focuses singularly on digital skills training without concurrently addressing the foundational issues of affordable and reliable connectivity. This echoes the "digital divide" literature,

which has evolved from a focus on mere access to a more nuanced understanding of the quality of access and the affordability barriers that create a "second-level" divide. Therefore, policy interventions must be integrated, combining investments in "hard" infrastructure (fiber optic cables, cell towers) with "soft" infrastructure (community learning hubs, subsidized data plans for MSMEs, and improved rural logistics).[15,16]

This study, while comprehensive, has certain limitations that offer avenues for future research. Firstly, the cross-sectional nature of the quantitative data does not allow for the establishment of definite causality over time. A longitudinal study that tracks a cohort of entrepreneurs over several years would provide more robust insights into the long-term impacts of digital literacy on business growth trajectories and SDG outcomes. Secondly, while the study covered three diverse regencies, Indonesia's vast archipelago contains immense cultural and economic diversity. Future research could expand the geographic scope or conduct comparative case studies between different types of rural economies, such as fishing communities and highland agricultural communities, to understand how contextual factors moderate the relationships identified in our model. Finally, this study relied on self-reported performance and impact metrics. Future studies could incorporate objective data, such as financial records or community-level economic statistics, to further validate the findings.

4. Conclusion

This research provides compelling, multi-faceted evidence that digital literacy is a transformative force for rural development in Indonesia. It is not merely about using technology; it is about empowering individuals with the capabilities to overcome long-standing barriers to market access, information, and networks. By enabling community entrepreneurs to build more resilient and profitable enterprises, digital literacy serves as a powerful catalyst for achieving fundamental Sustainable Development Goals at the grassroots level. Our integrated mixed-methods analysis leads to three core conclusions. First, digital literacy has a direct and significant positive impact on the performance of rural enterprises. Second, this empowerment is not solely an individual achievement but is deeply rooted in social learning within community networks. Third, the success of these digitally-enabled entrepreneurs creates a tangible multiplier effect, generating local jobs and increasing household incomes, thereby serving as a primary engine for poverty reduction and inclusive economic growth. The policy implications are clear. To unlock the full potential of the digital economy for rural communities, interventions must move beyond a narrow focus on infrastructure. A holistic strategy is required—one that invests in fostering community-based digital learning ecosystems, ensures affordable and reliable connectivity, and supports the integration of digital tools into the fabric of the local economy. By forging these digital pathways, Indonesia can build a more equitable and prosperous future, ensuring that the promise of the digital age becomes a reality for all its citizens.

5. References

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