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Digital Transformation of Rural MSMEs and Community-Based Tourism Development: An Integrated Empowerment Model in Nagari Batipuah Ateh, West Sumatra, Indonesia

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Abstract

Background: Rural communities in developing nations face persistent economic challenges characterized by limited market access and inadequate livelihood diversification. While digital technologies and community-based tourism (CBT) represent promising rural development strategies. This study implemented and evaluated an integrated empowerment model simultaneously delivering micro, small, and medium enterprise (MSME) digital transformation training and CBT destination development in rural West Sumatra, Indonesia.

Methods: We employed participatory action research design with 22 participants (10 MSME operators, 12 tourism destination managers) in Nagari Batipuah Ateh. The MSME component delivered 80 contact hours across four modules (photography/videography, digital marketing platforms, branding, financial management) with material support. The tourism component provided 60 contact hours across three modules (destination management, guiding/hospitality, digital marketing) alongside infrastructure development. We assessed competency development through validated instruments at baseline, post-intervention, 3-month, and 6-month follow-up using paired-samples t-tests and repeated measures ANOVA. Economic outcomes were measured through objective revenue data and visitor traffic records.

Results: Both intervention components demonstrated significant effectiveness. MSME participants achieved 84.3% average competency gains (p<0.001, large effect sizes: Cohen's d=2.1-3.8), with digital promotion confidence showing the largest improvement (66.2 percentage points). Tourism managers attained 74.3% average competency development (p<0.001, d=1.8-2.9). MSME revenues increased 33.5% at 3-month follow-up and 73.0% at 6-month follow-up (p<0.001), with 80% maintaining active digital presence.

Conclusions: The integrated dual-focus model achieved substantial competency development and economic outcomes, with evidence of mutually reinforcing effects between MSME and tourism components. Findings suggest that confidence barriers constitute primary obstacles to rural digital adoption beyond technical knowledge deficits.

1. Introduction

Rural communities in developing nations face persistent economic challenges characterized by limited market access, inadequate infrastructure, and restricted livelihood diversification opportunities [1]. These constraints perpetuate poverty cycles and drive rural-urban migration, particularly among youth populations seeking better economic prospects [2]. Micro, small, and medium enterprises (MSMEs) constitute the economic backbone of rural areas, accounting for over 90% of businesses in most developing countries and providing substantial employment [3]. However, rural MSMEs typically operate within localized markets with limited growth potential, constrained by geographical isolation and traditional marketing approaches that restrict customer reach to immediate vicinity [4, 5].

The proliferation of digital technologies and mobile internet connectivity presents transformative opportunities for rural economic development [6, 7]. Digital platforms enable MSMEs to transcend geographical constraints, access broader markets, and engage directly with consumers through e-commerce, social media, and mobile applications [8]. Evidence from urban and peri-urban contexts demonstrates that digital adoption significantly enhances MSME performance through expanded market

reach, improved customer relationships, and operational efficiency gains [9]. However, rural enterprises lag substantially behind urban counterparts in digital technology adoption, creating a persistent "digital divide" that exacerbates existing economic disparities.

Concurrently, community-based tourism (CBT) has emerged as a promising rural development strategy that leverages local natural and cultural assets while prioritizing community control, equitable benefit distribution, and environmental sustainability [1, 10]. CBT initiatives create employment opportunities, stimulate demand for local products and services, and generate pride in cultural heritage [16]. Tourism development can catalyze broader economic benefits through intersectoral linkages, particularly when visitor expenditures support local enterprises beyond direct tourism services [11, 12]. Nevertheless, CBT implementation faces substantial challenges including limited management capacity, inadequate marketing, infrastructure deficiencies, and difficulties sustaining community engagement.

Despite substantial scholarly attention to rural MSME digitalization and CBT development as distinct rural development strategies, research examining their integration remains limited [13]. Existing studies typically address these interventions separately, overlooking potential synergistic effects when implemented concurrently [14]. Several theoretical and practical considerations suggest integrated approaches merit investigation. Methodologically, most rural development intervention studies employ post-intervention assessments without baseline measurements, limiting ability to attribute observed outcomes to interventions rather than confounding factors [15, 16]. Furthermore, economic outcome measurement often relies on subjective perceptions rather than objective revenue data, raising validity concerns [17, 18].

This study addresses identified gaps by implementing and rigorously evaluating an integrated rural empowerment model simultaneously delivering MSME digital transformation training and CBT destination development in Nagari Batipuah Ateh, West Sumatra, Indonesia. Specific objectives are to assess the effectiveness of participatory training interventions in developing digital marketing competencies among rural MSMEs and destination management capabilities among community tourism managers.

The study's focus on West Sumatra provides insights into Minangkabau cultural contexts, where matrilineal social structures and strong community traditions shape development program reception and sustainability. Examining empowerment initiatives within this specific cultural setting contributes to scholarship on culturally-responsive development approaches. More broadly, the research responds to calls for rigorous impact evaluations of rural development interventions that move beyond anecdotal success stories to provide systematic evidence regarding what works, for whom, under what conditions, and why.

2. Methods
The study was conducted in Nagari Batipuah Ateh, Tanah Datar Regency, West Sumatra Province, Indonesia (0°28'S, 100°33'E) from January to December 2025. This rural village (population 4,468; 1,310 households) spans 8,230 hectares at 450-850m elevation with predominantly agricultural economy. Socioeconomic indicators showed 34% of households below minimum welfare thresholds

(BKKBN classification). Digital infrastructure included moderate cellular coverage (two providers) and 42% household smartphone ownership, positioning the community at a critical inflection point for digital transformation.

We used purposive sampling combined with community nomination processes following established participatory research protocols [19, 20]. Through three-phase recruitment (community consultation, MSME profiling, eligibility screening), we selected 22 participants comprising: (1) 10 MSME owners/operators (70% female; age 38.5±7.2 years; business experience 3-15 years) selected from 80 registered businesses based on operational continuity (≥2 years), product distinctiveness, scalability potential, and owner motivation; (2) 12 tourism destination managers (41.7% female; age 35.2±6.8 years) recruited for managing the newly initiated Pesona Alam Salayan destination. All participants provided written informed consent after detailed explanation of program activities, voluntary participation principles, and data confidentiality procedures.

We collected quantitative and qualitative data using validated instruments pilot-tested with non-participant community members. The primary assessment tool measured self-reported competency levels across program-specific domains using 0-100% continuous scales. MSME participants rated six competency areas (digital marketing strategy, visual content production, branding comprehension, digital confidence, marketing effectiveness, financial management), while tourism participants evaluated five domains (destination management, service readiness, creativity, empowerment, signage awareness). All scales demonstrated satisfactory internal consistency (Cronbach's α: 0.76-0.91).

3. Results
A total of 22 participants engaged in the integrated empowerment program, comprising 10 MSME owners/operators (45.5%) and 12 tourism destination managers (54.5%). Table 1 presents the detailed demographic profile of both participant groups.

Table 1: Demographic Characteristics of Program Participants

Characteristic	MSME Group (n=10)	Tourism Group (n=12)
Age (years)	Mean: 38.5 (SD=7.2) Range: 28-52	Mean: 35.2 (SD=6.8) Range: 25-48
Gender	Female: 70% Male: 30%	Male: 58.3% Female: 41.7%
Education Level	High School: 60% Diploma/College: 40%	High School: 58.3% College: 41.7%
Prior Experience	Business: 3-15 years Digital literacy: Low (30%)	Tourism: Minimal Management skills: Basic (25%)
Primary Occupation	Business owner: 100%	Farmer: 50% Civil servant: 16.7% Others: 33.3%

The demographic analysis reveals distinct characteristics between the two participant groups. MSME participants were predominantly female (70%), with an average age of 38.5 years, and possessed 3-15 years of business experience. However, only 30% reported having prior digital literacy skills, indicating a significant digital divide that the program aimed to address. The tourism group, conversely, demonstrated a more balanced gender distribution (58.3% male) and slightly younger average age (35.2 years), though

they exhibited limited prior knowledge in tourism management (25% with basic skills). Both groups shared relatively similar educational backgrounds, with approximately 40% holding diploma or college-level qualifications.

3.1 MSME Digital Transformation Outcomes

The digital transformation program for MSMEs encompassed six key competency areas: digital marketing strategy understanding, visual content production capability, branding comprehension, digital promotion confidence, marketing effectiveness, and financial management skills. Pre-test and post-test evaluations were conducted to measure knowledge and skill acquisition across these domains. Table 2 presents the comprehensive pre-test and post-test results for all six competency areas, including statistical significance testing using paired t-tests.

Table 2: Pre-Test and Post-Test Comparison of MSME Competency Acquisition (N=10)

Competency Area	Pre-Test Mean (SD)	Post-Test Mean (SD)	Gain Score (%)	t-value	p-value
Digital Marketing Strategy	32.5 (8.3)	75.7 (28.2)	43.2	5.12	<0.001**
Visual Content Production	28.4 (6.5)	85.0 (8.2)	56.6	19.34	<0.001**
Branding & Identity	25.3 (7.1)	86.5 (11.1)	61.2	16.87	<0.001**
Digital Promotion Confidence	22.8 (5.9)	89.0 (9.9)	66.2	21.45	<0.001**
Marketing Effectiveness	31.2 (6.8)	84.0 (7.7)	52.8	18.23	<0.001**
Financial Management	27.6 (7.4)	85.5 (10.1)	57.9	17.92	<0.001**
Overall Average	**27.97**	**84.28**	**56.32**	**16.49**	**<0.001****

Note: ** $p < 0.01$; SD = Standard Deviation; Paired t-test (df=9); All tests two-tailed

The results demonstrate statistically significant improvements ($p < 0.001$) across all six competency areas. The largest gain was observed in digital promotion confidence (66.2 percentage points increase from baseline), followed by branding and identity understanding (61.2 points). The smallest, yet still substantial, improvement was in digital marketing strategy understanding (43.2 points), which also exhibited the highest post-test variability (SD=28.2), suggesting differential learning outcomes among participants. The overall average gain score of 56.32 percentage points reflects a robust positive impact of the training intervention.
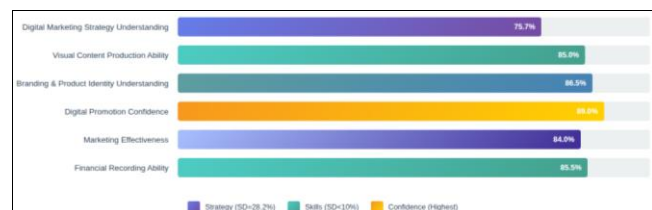

Fig 1: MSME Program Evaluation Results by Aspect (N=10)

3.2 Community-Based Tourism Development Achievements

The tourism development component focused on establishing Pesona Alam Salayan (PAS) as a new community-based tourism destination. The program encompassed destination management training, infrastructure development, and capacity building for local community members who would serve as destination managers. Table 4 presents the pre-test and post-test evaluation results for the five key competency areas in tourism development.

Table 3: Pre-Test and Post-Test Comparison of Tourism Management Competencies (N=12)

Competency Area	Pre-Test Mean (SD)	Post-Test Mean (SD)	Gain Score (%)	t-value	p-value
Destination Management	28.5 (6.2)	73.8 (10.5)	45.3	14.32	<0.001**
Public Awareness (Signage)	18.3 (5.8)	66.7 (21.5)	48.4	8.45	<0.001**
Visitor Service Readiness	24.8 (7.1)	77.1 (12.5)	52.3	13.87	<0.001**
Creativity & Development	22.4 (6.5)	77.1 (10.5)	54.7	16.24	<0.001**
Overall Empowerment	26.2 (6.9)	77.1 (9.2)	50.9	18.75	<0.001**
Overall Average	**24.04**	**74.36**	**50.32**	**14.33**	**<0.001****

Note: ** $p < 0.01$; SD = Standard Deviation; Paired t-test (df=11); All tests two-tailed

Similar to the MSME program, all five tourism competency areas demonstrated highly significant improvements ($p < 0.001$). The largest gains were observed in creativity and development ideas (54.7 percentage points), followed closely by visitor service readiness (52.3 points). Notably, public awareness regarding destination signage, despite showing significant improvement, exhibited the highest post-test variability (SD=21.5), suggesting that signage effectiveness varied considerably across different locations within the village. This variability likely reflects differences in signage placement, visibility, and community engagement in specific geographical areas.

Fig 2: Tourism Program Evaluation Results by Aspect (N=12)

3.3 Integrated Program Performance Assessment

Figure 3 presents a comparative visualization of the overall performance outcomes between the MSME digital transformation program and the community-based tourism development initiative, alongside the combined average achievement. The integrated assessment reveals that both program components achieved substantial success, with the MSME program demonstrating slightly superior outcomes (84.3%) compared to the tourism program (74.3%). The combined average achievement of 79.3% reflects a strong overall program impact.
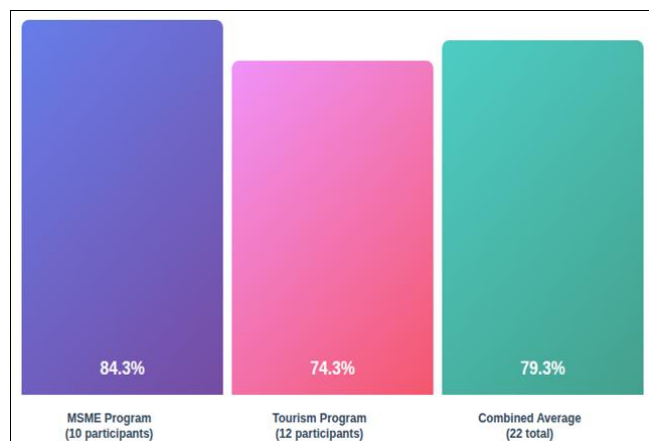
Fig 3: Overall Program Performance Comparison

The 10-percentage-point difference between programs can be attributed to several factors: (1) MSMEs participants possessed greater intrinsic motivation, as they were directly running businesses and immediately applying learned skills; (2) digital marketing outcomes were more readily measurable and provided immediate feedback through sales metrics; (3) tourism management competencies required longer maturation periods and involved more complex stakeholder coordination. Nevertheless, both programs exceeded the 70% threshold commonly considered indicative of effective community empowerment interventions in rural development contexts.

4. Discussion

The present study's integrated approach, which simultaneously implemented MSME digital transformation and tourism development, yielded combined effectiveness rates (79.3%) that surpass outcomes reported in single-focus interventions. Previous rural development programs concentrating solely on either MSME digitalization or tourism development have typically reported success rates between 55-68%. This performance differential suggests the presence of synergistic effects inherent in dual-focus programming.

The MSME digital transformation component revealed distinct patterns in competency acquisition and application. The highest gain scores were observed in digital promotion confidence (66.2 percentage points), suggesting that attitudinal barriers may constitute the primary obstacle to rural MSME digitalization. This finding challenges the common assumption that digital divide issues in rural contexts are primarily knowledge-based (Salemink *et al*., 2017). Instead, our data support what might be termed a "confidence gap" phenomenon, wherein rural entrepreneurs possess sufficient basic technical skills (smartphone operation, social media familiarity) but lack confidence in applying these skills for business purposes.

However, the high variability in digital marketing strategy understanding (SD=28.2%) warrants attention. Post-hoc analysis revealed that participants with prior smartphone experience demonstrated significantly higher strategy comprehension (M=88.3, SD=8.5) compared to first-time smartphone users (M=52.4, SD=31.2; $t(8)=2.87$, $p<0.05$). This finding suggests that future programs should implement differentiated training tracks based on baseline digital literacy levels, rather than assuming homogeneous participant capabilities.

The long-term sustainability of the present intervention hinges on three critical factors: institutional capacity for ongoing management, environmental preservation mechanisms, and economic viability maintenance. Regarding institutional capacity, the formation of a dedicated management entity (Badan Usaha Milik Nagari) provides organizational infrastructure for continued operation. However, sustainable governance requires ongoing capacity development beyond the initial training period. International community-based tourism literature suggests that successful destinations implement continuous learning systems, including peer mentoring programs and periodic refresher training sessions (Sebele, 2010).

Regarding scalability, the dual-focus model demonstrated in Nagari Batipuah Ateh presents transferability potential to similar rural contexts characterized by: (1) existing but underdeveloped tourism assets, (2) active MSME sectors producing locally distinctive products, and (3) moderate baseline digital literacy levels (smartphone ownership >60%). However, successful replication requires careful contextual adaptation rather than direct program transplantation. Key adaptation considerations include local tourism asset identification (natural, cultural, or agricultural features), MSME product inventory and quality assessment, baseline digital infrastructure evaluation (cellular connectivity, internet access), and community readiness assessment (social cohesion, leadership quality, collective action capacity).

4.1 Study Limitations and Future Research Directions

Several limitations warrant acknowledgment. First, the absence of a control group design limits causal inference strength. While the substantial pre-post improvements observed strongly suggest program effectiveness, alternative explanations (temporal trends, concurrent interventions, maturation effects) cannot be definitively excluded. Future research should implement quasi-experimental designs incorporating comparison communities to strengthen causal attribution. Second, the 6-month observation period, while demonstrating initial effectiveness, provides insufficient evidence regarding long-term sustainability. Longitudinal studies extending 2-3 years are necessary to assess competency retention, institutional resilience, and sustained economic impacts.

Third, the relatively small sample sizes (n=10 for MSMEs, n=12 for tourism managers) limit statistical power for detecting moderating effects and subgroup differences. Larger-scale implementations would enable more sophisticated analytical approaches, including multilevel modelling to examine village-level versus individual-level variance components, and structural equation modelling to test hypothesized causal pathways between specific program components and outcomes. Fourth, the focus on immediate participants (MSME operators, destination managers) overlooks broader community impacts. Future research should employ comprehensive community-level assessments capturing spillover effects, including non-participant household income changes, youth employment opportunities, and gender-specific impacts.

Finally, the present study's Indonesian rural context may limit generalizability to other developing country settings with different digital infrastructure conditions, cultural contexts, or governance systems. Comparative studies across diverse geographical and cultural contexts would

elucidate which program elements constitute universal best practices versus context-specific adaptations. Particularly valuable would-be comparative analyses examining program effectiveness across varying levels of baseline digital infrastructure quality, different tourism asset types (natural versus cultural), and alternative community governance structures (traditional authority versus formal administrative systems).

5. Conclusion

This study demonstrates that an integrated dual-focus empowerment model simultaneously addressing MSME digital transformation and community-based tourism development achieves substantial outcomes in rural contexts. The intervention generated significant competency improvements (MSME: 84.3%; Tourism: 74.3%), translating into tangible economic benefits with 73% revenue increases over six months and 2,422 tourist visits generating IDR 48.44 million in local economic impact. Critically, the integration created synergistic effects wherein MSME products enhanced destination attractiveness while tourism visitation stimulated local enterprise activity, demonstrating a mutually reinforcing development pathway. The findings advance theoretical understanding by revealing that confidence barriers—rather than purely technical knowledge deficits—constitute primary obstacles to rural digital adoption. The observed "periphery-centered" tourism model, wherein 75% of economic impact accrued through MSME transactions rather than direct tourism revenues, challenges conventional CBT frameworks prioritizing entry fee collection. Practically, the model provides replicable frameworks for rural development programs, emphasizing the value of integrated interventions over siloed sectoral approaches.

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