

FROM TRADITIONAL TO DIGITAL: ECONOMIC EMPOWERMENT MODEL FOR SEAFOOD AND HERBAL PRODUCT COMMUNITIES IN PULAU KETAM

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This study investigates the transformation of traditional fishing and herbal product communities in Pulau Ketam through innovative digital empowerment strategies. Located off Port Klang, Selangor, Pulau Ketam represents a unique case study of coastal community development challenges and opportunities in Malaysia's digital economy era. The research employs a participatory action research methodology, involving 150 community members through focus group discussions, in-depth interviews, and digital literacy workshops conducted between March-September 2024. Key findings reveal that 78% of participants experienced significant income improvements averaging 45% through e-commerce platform adoption, while 65% of traditional herbal product sellers successfully transitioned to online marketing channels. The study introduces an integrated digital empowerment framework incorporating infrastructure development, capacity building, market access facilitation, and sustainable community partnerships. Results demonstrate that strategic digital intervention can preserve traditional knowledge while enhancing economic resilience, contributing RM 2.3 million to local GDP within the intervention period. This research provides valuable insights for policymakers and development practitioners working on rural digitalization initiatives across Southeast Asia.

Keywords: *Community Empowerment, Digital Transformation, Economic Development, Fishing Communities, Rural Entrepreneurship*

INTRODUCTION

Malaysia's digital transformation has accelerated dramatically, positioning the nation as a regional leader in Southeast Asia's digital economy revolution. The digital sector currently contributes 23.2% to Malaysia's gross domestic product as of 2023, with ambitious projections to reach 25.5% by 2025 under the comprehensive Malaysia Digital Economy Blueprint (MyDIGITAL) framework (Malaysia Digital Economy Corporation, 2024). This transformation represents one of the most significant economic shifts in Malaysia's modern history, creating unprecedented opportunities for traditionally marginalized communities to participate in the digital economy. The convergence of digital infrastructure development and traditional economic sectors presents unique opportunities for community empowerment, particularly in coastal fishing communities that have historically relied on conventional livelihood strategies. Malaysia's internet penetration rate of 97.4% and widespread mobile connectivity create an enabling environment for rural digital transformation initiatives, while the fishing industry continues to play a crucial role in national food security and rural employment.

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Dian Septiana Sari et al

Table 1. Malaysia's Digital Economy and Traditional Sectors: Key Indicators 2023-2024

Economic Indicator	2023 Value	2024 Projection/Actual	Growth Rate	Source
Digital Economy				
GDP Contribution	23.2%	25.5%	+9.9%	MDEC (2024)
Digital Investments	RM 46.3 billion	RM 163.6 billion	+253.6%	MIDA (2024)
Internet Penetration	96.8%	97.4%	+0.6%	MCMC (2024)
Social Media Users	27.9 million	28.68 million	+2.8%	DataReportal (2024)
Digital Jobs Created	23,000	48,000+	+108.7%	MDEC (2024)
Fishing Industry				
Production Value	RM 15.9 billion	RM 16.5 billion	+3.8%	DOF Malaysia (2024)
GDP Contribution	0.8%	0.8%	0%	Department Statistics (2024)
Total Production	1.89 million MT	1.79 million MT	-5.3%	DOF Malaysia (2024)
Employment	114,000	116,000	+1.8%	Statistics Malaysia (2024)
Demographics				
Total Population	34.1 million	34.49 million	+1.1%	Statistics Malaysia (2024)
Urban Population	78.7%	78.9%	+0.3%	DataReportal (2024)
Rural Population	21.3%	21.1%	-0.9%	DataReportal (2024)
Median Age	30.8 years	31.0 years	+0.6%	DataReportal (2024)

Sources: Malaysia Digital Economy Corporation (MDEC), Malaysian Investment Development Authority (MIDA), Malaysian Communications and Multimedia Commission (MCMC), Department of Fisheries Malaysia (DOF), Department of Statistics Malaysia, DataReportal Digital 2024

The data presented in Table 1 reveals several critical trends that underscore the urgency and opportunity for digital transformation in traditional fishing communities. Most significantly, Malaysia's digital economy has experienced explosive growth, with digital investments increasing by over 250% in a single year, reaching RM 163.6 billion in 2024. This unprecedented investment influx has created more than 48,000 new digital economy jobs, representing a 108.7% increase from the previous year. The digital sector's contribution to GDP is projected to reach 25.5% by 2025, demonstrating the government's commitment to positioning Malaysia as a regional digital hub. Simultaneously, internet penetration has reached near-universal coverage at 97.4%, creating the technological foundation necessary for widespread digital inclusion initiatives.

In contrast to the digital economy's robust growth, Malaysia's traditional fishing industry presents a more complex picture of challenges and opportunities. While the total production value increased by 3.8% to RM 16.5 billion in 2024, actual fish production declined by 5.3% from 1.89 million metric tons to 1.79 million metric tons, indicating rising prices but declining resource availability. The industry continues to provide employment for approximately 116,000 individuals, representing a modest 1.8% increase, but its contribution to national GDP has remained static at 0.8%. This stagnation occurs despite the sector's critical importance to national food security and rural livelihoods, highlighting the need for innovative approaches to enhance productivity and economic viability within traditional fishing communities. The demographic composition of Malaysia further reinforces the potential for digital transformation initiatives in rural areas.

With 21.1% of the population residing in rural areas and a median age of 31.0 years, there exists a substantial demographic foundation for technology adoption and digital skill development. The high social media penetration rate of 83.1% (28.68 million users) indicates that rural communities already possess basic digital engagement capabilities that can be leveraged for economic development purposes. However, the slight decline in rural population percentage (-0.9%) suggests ongoing rural-to-urban migration patterns that digital empowerment initiatives could help reverse by creating viable economic opportunities in rural communities. The convergence of these trends creates a unique window of opportunity for comprehensive community development interventions that bridge traditional livelihoods with digital economic participation. The Malaysian government's substantial investment in digital infrastructure, combined with the fishing industry's need for innovation and market access expansion, establishes ideal conditions for piloting integrated digital empowerment models. Pulau Ketam, as a traditional fishing community with existing tourism potential and cultural heritage value, represents an optimal case

study location for testing scalable approaches to rural digital transformation that preserve cultural identity while enhancing economic resilience. Pulau Ketam, strategically located off Port Klang in Selangor, exemplifies the challenges and opportunities facing traditional coastal communities in Malaysia's rapidly digitalizing economy. The island is home to two predominantly Chinese fishing villages founded circa 1880, with Kampung Pulau Ketam and Kampung Sungai Lima collectively supporting approximately 30,000 residents whose livelihoods have traditionally centered on fishing, aquaculture, and small-scale tourism. The community represents one of Malaysia's most significant traditional fishing settlements, possessing rich cultural heritage, extensive traditional ecological knowledge, and established networks of herbal medicine practitioners who maintain centuries-old wellness traditions.

Recent infrastructure developments have positioned Pulau Ketam for digital transformation, particularly through the Malaysian Communications and Multimedia Commission's (MCMC) Pulau Ketam Stingray II project, which installed a 46.4-kilometer underwater fiber optic cable providing high-speed internet connectivity between the island and mainland Malaysia. This infrastructure investment, recognized internationally through the World Summit on the Information Society (WSIS) Prizes 2025, demonstrates governmental commitment to bridging the digital divide for remote island communities. The connectivity enhancement coincides with broader national initiatives including the National Digital Infrastructure Plan (JENDELA) and the Digital Economy Blueprint, creating synergistic conditions for comprehensive community development interventions. The urgency for economic diversification in Pulau Ketam stems from multiple interconnected challenges confronting traditional fishing communities throughout Southeast Asia. Climate change impacts, including sea level rise and changing weather patterns, pose increasing threats to traditional fishing practices and coastal infrastructure. Environmental studies indicate that almost all existing village settlements at Pulau Ketam will be affected by a 0.53-meter increase in maximum water level rise by 2100, necessitating adaptive strategies for long-term community resilience. Additionally, the community faces significant waste management challenges, inadequate healthcare infrastructure, and limited economic diversification opportunities that constrain income generation and youth retention.

Simultaneously, Malaysia's herbal and traditional products market demonstrates tremendous growth potential, driven by increasing consumer interest in natural wellness solutions and traditional remedies. The direct selling industry in Malaysia generated \$9.5 billion in retail sales in 2023, with health and wellness companies representing the most prominent sector. Traditional communities like Pulau Ketam possess extensive indigenous knowledge of herbal remedies and traditional wellness practices that could be effectively commercialized through digital marketing channels while preserving cultural authenticity and ensuring knowledge transmission to younger generations. This research addresses the critical gap between traditional community livelihoods and emerging digital economic opportunities by developing an integrated empowerment model specifically designed for coastal fishing communities. The study's primary objectives encompass: (1) conducting comprehensive assessments of current socio-economic conditions and digital readiness within Pulau Ketam communities; (2) designing and implementing a culturally appropriate digital empowerment intervention framework; (3) evaluating the effectiveness of digital transformation initiatives on community economic outcomes, social cohesion, and cultural preservation; (4) developing a replicable and scalable framework for similar coastal communities throughout Southeast Asia; and (5) contributing theoretical and practical insights to the broader discourse on inclusive rural digital transformation in developing economies.

LITERATURE REVIEW

The digital transformation of rural communities has emerged as a critical area of scholarly inquiry, particularly in the context of developing economies. Rural transformation is defined as a comprehensive process that changes activities in rural communities from traditional-based activities to advanced digital economic activities. This transformation encompasses efficiency in achieving rapid economic growth, fair distribution of wealth, sustainability considerations, and empowerment of vulnerable populations.

Digital Economy and Community Development Framework

Indonesia's digital economy, projected to exceed \$130 billion by 2025, demonstrates the potential for digital transformation in Southeast Asian coastal communities, with digital payments expected to grow by 15% in 2025. Malaysia's digital economy strategy aligns with regional trends, particularly through the National Digital Infrastructure Plan (JENDELA) and initiatives targeting rural connectivity. According to Malaysia Communications and Multimedia Commission (MCMC), there are 75.6% internet users in urban areas while rural areas have only 24.4%, creating a significant digital divide that requires targeted intervention. The government's commitment to

achieving 100% 4G coverage in populated areas by 2025 provides the infrastructure foundation necessary for community-based digital initiatives.

Seafood Industry Digital Transformation

The Malaysian seafood sector represents a significant economic opportunity, with the fishing industry responsible for MYR 11.5 billion (USD 2.5 billion) of gross domestic product in 2022, including MYR 4.2 billion (USD 952 million) in seafood exports. However, traditional fishing communities face mounting challenges from stock depletion and market access limitations. The Asia-Pacific seafood market demonstrates strong growth potential, with online distribution channels projected as the fastest-growing segment with an expected CAGR of approximately 6% during 2024-2029, driven by increasing digitalization in trade and retail. Malaysian aquaculture sector, valued at over USD 700 million, increasingly relies on online markets and digital platforms to solve distribution challenges.

Herbal Products and Traditional Knowledge Systems

Malaysia's rich biodiversity and traditional knowledge systems present unique opportunities for value-added product development. The herbal products market globally shows substantial growth, with consumers seeking holistic health solutions and plant-based remedies. Digital marketing strategies for herbal products must emphasize transparency, education, and consumer engagement while complying with regulatory frameworks. Malaysia's direct selling market, ranked #6 globally and 4th in Asia Pacific, generated \$9.5 billion in retail sales in 2023, with health and wellness companies being the most prominent in the Malaysian network marketing industry. This market structure provides opportunities for traditional communities to access wider distribution networks through digital channels.

Community Empowerment and Digital Inclusion Models

Recent research emphasizes the importance of participatory approaches to rural digital transformation. Malaysia's Anugerah Desa Maju (ADM) initiative recognizes villages for community development and innovation, with winners receiving financial incentives for socio-economic development projects. Studies on digital capabilities in low literacy rate areas reveal that rural communities increasingly rely on smartphones and internet access, with significant potential for digital inclusion initiatives. The Malaysian Communications and Multimedia Commission's (MCMC) Nadi Digital Inclusive Project won international recognition in 2025 for providing digital literacy and economic opportunities to remote island communities, demonstrating successful models for coastal community development. The Pulau Ketam Stingray II project specifically installed a 46.4km underwater fiber optic cable providing high-speed connectivity, creating the technical foundation for digital transformation initiatives.

Research Gap and Theoretical Framework

While existing literature provides valuable insights into digital transformation strategies, limited research addresses the specific challenges and opportunities facing traditional fishing communities transitioning to digital economies. Most studies focus on urban or agricultural contexts, leaving coastal fishing communities underexplored in digital empowerment research. This study contributes to the literature by developing an integrated theoretical framework combining community-based participatory development, digital inclusion theory, and traditional knowledge preservation approaches. The framework emphasizes the importance of preserving cultural identity while facilitating economic modernization through strategic digital intervention.

METHOD

This research employs a participatory action research (PAR) methodology, emphasizing community involvement in all phases of the research process. The study was conducted in Pulau Ketam, Selangor, Malaysia, from March to September 2024, involving both Kampung Pulau Ketam and Kampung Sungai Lima villages.



Figure 1. Research Design and PAR Implementation Phases in Pulau Ketam (March–September 2024)

Table 2. Data Collection Methods

Type	Methods / Activities
Quantitative Data Collection	<ul style="list-style-type: none"> - Pre- and post-intervention surveys measuring income changes, digital adoption rates, and market access improvements - Economic impact assessments using household income tracking - Digital usage analytics from e-commerce platforms and social media engagement
Qualitative Data Collection	<ul style="list-style-type: none"> - 15 focus group discussions (8–12 participants each) exploring community experiences and perspectives - 45 in-depth interviews with key informants from different stakeholder groups - Participant observation during workshops and community events - Digital storytelling sessions capturing transformation narratives

Table 3. Digital Intervention Framework

Component	Key Programs / Activities
1. Infrastructure Development	<ul style="list-style-type: none"> - Partnership with local telecommunications providers to optimize internet connectivity - Establishment of community digital hubs with shared computers and high-speed internet - Mobile charging stations and device accessibility programs
2. Capacity Building and Digital Literacy	<ul style="list-style-type: none"> - Structured digital literacy training programs in local dialects (Teochew, Hokkien, Mandarin) - E-commerce platform training on product listing, pricing, and customer service - Social media marketing workshops (Facebook, Instagram, emerging platforms) - Basic financial literacy and digital banking education
3. Market Access Facilitation	<ul style="list-style-type: none"> - Development of a community e-commerce collective under the brand “Pulau Ketam Authentics” - Partnership negotiations with major Malaysian e-commerce platforms (Shopee, Lazada, Grab)

FROM TRADITIONAL TO DIGITAL: ECONOMIC EMPOWERMENT MODEL FOR SEAFOOD AND HERBAL PRODUCT COMMUNITIES IN PULAU KETAM

Dian Septiana Sari et al

	<ul style="list-style-type: none"> - Creation of digital catalogs showcasing traditional seafood and herbal products - Logistics coordination for product delivery from the island to the mainland
4. Sustainable Community Partnerships	<ul style="list-style-type: none"> - Collaboration with the Malaysian Nature Society for environmental sustainability integration - Partnership with University of Malaya researchers for ongoing monitoring and evaluation - Engagement with state tourism authorities for ecotourism development - Linkages with traditional medicine associations for product quality assurance

Digital Empowerment Framework = Infrastructure + Capacity Building + Market Access + Community Partnerships.

Table 4. Data Analysis Techniques

Type	Techniques / Procedures
Quantitative Analysis	<ul style="list-style-type: none"> - Descriptive and inferential statistics using SPSS 28.0 - Paired t-tests to assess pre- and post-intervention changes - Correlation analysis to identify relationships between variables - Regression analysis to determine factors influencing successful digital adoption
Qualitative Analysis	<ul style="list-style-type: none"> - Thematic analysis procedures - Transcription of interviews and focus groups in original languages with professional translation - Inductive coding to identify emerging themes and patterns - Member checking to validate interpretations with community participants - Triangulation across data sources to enhance validity

Table 5. Ethical Considerations and Community Protocols

Aspect	Key Practices
Ethical Considerations	<ul style="list-style-type: none"> - Informed consent in participants' preferred languages - Voluntary participation with right to withdraw without consequences - Data confidentiality and anonymity protection - Community ownership of research outcomes and shared intellectual property rights
Community & Cultural Protocols	<ul style="list-style-type: none"> - Respect for traditional fishing seasons and community ceremonies - Collaboration with village elders and traditional leaders - Integration of local decision-making processes into research planning

RESULTS AND DISCUSSION

The implementation of the digital empowerment framework in Pulau Ketam demonstrated significant positive outcomes across multiple dimensions of community development. This section presents comprehensive findings from the six-month intervention period, analyzing both quantitative impacts and qualitative transformations within the fishing and herbal product communities.

Economic Impact and Income Generation

The most significant finding relates to measurable economic improvements experienced by participating community members. Pre-intervention baseline data revealed that 73% of fishing families earned below RM2,000 monthly, with seasonal variations creating periods of economic hardship particularly during monsoon seasons when traditional fishing activities are limited. Post-intervention analysis demonstrates substantial income improvements across all participant categories. Among the 60 participating fishing families, 78% reported income increases averaging 45% above baseline measurements. Traditional fishermen who adopted e-commerce sales strategies for their catches reported monthly income increases ranging from RM300 to RM800, with peak improvements reaching 65% during traditionally low-earning periods. The herbal product seller cohort experienced even more dramatic transformations. Of the 35 traditional herbal product sellers who participated in digital marketing training, 65%

successfully transitioned to online sales channels, with 23 participants establishing active social media presence and e-commerce storefronts. Average monthly income for this group increased by 52%, with the highest performers achieving 85% income growth through expanded market reach beyond traditional local sales networks.

Economic Impact Summary:

- Total community economic impact: RM 2.3 million over 6-month period
- Average household income increase: 45% (ranging from 15% to 85%)
- New digital revenue streams created: 147 individual accounts
- E-commerce platform registrations: 89 active sellers
- Social media marketing adoption rate: 67% of participants

Digital Adoption and Technology Integration (TNR 12 Bold)

The research revealed impressive rates of digital technology adoption, particularly considering the initial low baseline of digital literacy within the community. Pre-intervention assessments indicated that only 23% of participants had previous experience with e-commerce platforms, while 45% had never used social media for business purposes. Following the structured capacity building program, digital adoption rates increased dramatically. Smartphone utilization for business purposes rose from 34% to 89% of participants, with most community members successfully learning to use basic e-commerce functions including product photography, listing creation, and customer communication through messaging applications. Social media engagement showed particularly strong growth, with community members establishing 127 new business-focused social media accounts across Facebook (78 accounts), Instagram (41 accounts), and TikTok (8 accounts). The community's collective social media presence generated over 15,000 followers during the intervention period, with individual accounts ranging from 50 to 1,200 followers. Platform usage analysis revealed interesting preferences aligned with community demographics and customer bases. Older participants (45+ years) showed strong preference for Facebook, which proved effective for reaching Malaysian consumers interested in traditional products. Younger participants embraced Instagram and TikTok, successfully targeting younger urban consumers interested in authentic island experiences and heritage products.

Market Access and Product Diversification (TNR 12 Bold)

One of the most significant outcomes involved the dramatic expansion of market access for traditional island products. Prior to the intervention, 86% of seafood and herbal product sales occurred within the island community or to visiting tourists, limiting growth potential and creating vulnerability to seasonal tourism fluctuations. Digital platform integration enabled community members to access mainland Malaysian markets for the first time. The establishment of the collective brand "Pulau Ketam Authentics" created a unified identity that helped small producers compete effectively on major e-commerce platforms. Through coordinated marketing efforts, the community successfully positioned their products as premium, authentic alternatives to mass-produced equivalents. Product diversification emerged as an unexpected outcome of the digital transformation process. Traditional fishermen began creating value-added products including smoked fish, traditional fish crackers, and preserved seafood delicacies specifically for online sales. Herbal product sellers expanded their offerings to include packaged traditional remedies, herbal teas, and wellness consultation services delivered through video calls. The most successful product innovations combined traditional knowledge with modern packaging and marketing approaches. Traditional herbal treatments for common ailments, previously only available through direct consultation with village healers, were adapted into packaged products with clear instructions and ingredient lists that met online marketplace requirements while preserving traditional formulation knowledge.

Market Expansion Results:

- Geographic reach: Extended to 11 Malaysian states
- Product categories created: 34 new product lines
- Average order value: RM67 (compared to RM23 for traditional local sales)
- Repeat customer rate: 43% within 3-month period
- Cross-selling success rate: 56% of customers purchased multiple product categories

Community Capacity Building and Knowledge Transfer

The participatory approach to capacity building yielded significant improvements in community-wide digital literacy and business skills. The training program, delivered in local dialects with culturally appropriate examples, achieved high engagement rates and knowledge retention. Digital literacy assessments demonstrated substantial learning outcomes. Pre-training evaluations revealed that 67% of participants rated their digital skills as "very basic" or "none." Post-training assessments showed that 82% of participants achieved "intermediate" or "advanced" digital literacy levels, with skills including smartphone photography, social media management, basic graphic design using mobile applications, and online customer service communication.

Particularly encouraging was the development of peer-to-peer knowledge sharing networks within the community. Younger participants, who generally learned digital skills more rapidly, began serving as informal mentors for older community members. This organic knowledge transfer system ensured sustainability of learning beyond the formal intervention period. Women's participation in the digital economy showed remarkable growth. While traditional fishing activities were predominantly male-dominated, digital commerce created new opportunities for women's economic participation. Women comprised 73% of successful herbal product sellers and 45% of value-added seafood product entrepreneurs, indicating that digital transformation can contribute to gender equity in traditional communities.

Cultural Preservation and Heritage Integration

A critical concern throughout the intervention involved balancing economic modernization with cultural preservation. The research findings demonstrate that digital transformation, when appropriately designed, can actually strengthen rather than threaten traditional cultural practices and knowledge systems. Digital documentation projects initiated during the research period resulted in the creation of comprehensive digital archives preserving traditional fishing techniques, herbal remedy formulations, and cultural practices. Community elders worked with younger participants to create video content explaining traditional knowledge, ensuring intergenerational knowledge transfer while simultaneously creating valuable content for online marketing.

Traditional herbal knowledge benefited particularly from digital integration. Previously, traditional remedies and their applications were transmitted orally between generations, creating risks of knowledge loss. The digital documentation process enabled traditional healers to record detailed formulations, preparation methods, and application instructions while maintaining appropriate respect for indigenous knowledge systems. Cultural tourism integration emerged as an unexpected benefit of digital transformation. Social media content showcasing traditional life in Pulau Ketam attracted increased interest from cultural tourists seeking authentic experiences. This created additional revenue streams while providing incentives for cultural preservation and practice continuation.

Environmental Sustainability and Community Resilience

The digital transformation initiative integrated environmental sustainability considerations throughout implementation, recognizing the critical relationship between community economic well-being and environmental health. Partnership with the Malaysian Nature Society ensured that economic development activities supported rather than threatened the fragile mangrove ecosystem surrounding Pulau Ketam. Digital sales platforms enabled community members to add value to existing fishing activities without increasing pressure on fish stocks. Instead of simply selling raw fish, community members could command higher prices for processed and preserved products, improving economic outcomes while reducing harvesting pressure on marine resources. Waste reduction emerged as an additional benefit of digital integration. Traditional marketing approaches required printed materials and physical advertising, while digital marketing eliminated these material requirements. Additionally, direct-to-consumer online sales reduced packaging waste associated with traditional distribution chains.

The research identified several challenges that required adaptive management throughout the intervention period. Internet connectivity proved unreliable during certain weather conditions, requiring the development of offline backup systems and flexible scheduling for online activities. Language barriers initially slowed adoption rates, leading to the development of multilingual training materials and the recruitment of bilingual community facilitators. Financial literacy concerns emerged as participants began earning higher incomes through digital sales. Additional training modules were developed focusing on savings, investment, and tax obligations to ensure that economic improvements translated into long-term financial stability.

Sustainability and Scalability Analysis

Long-term sustainability analysis indicates strong potential for continued growth beyond the initial intervention period. Community ownership of digital marketing activities reached 89% by the end of the intervention, with most participants confident in their ability to continue and expand their digital presence independently. The establishment of a community digital cooperative provides institutional support for continued development. The cooperative model enables shared resources including internet connectivity, technical support, and collective purchasing of digital services while maintaining individual entrepreneurial initiative. Scalability potential appears strong based on the intervention results. The methodological framework developed through this research could be adapted for other traditional fishing communities throughout Southeast Asia facing similar challenges of economic modernization while preserving cultural identity. The research contributes valuable insights to the broader discourse on rural digital transformation, demonstrating that traditional communities can successfully integrate digital technologies when interventions are designed with appropriate cultural sensitivity and community participation. The Pulau Ketam model provides a replicable framework for similar communities seeking to balance economic development with cultural preservation.

CONCLUSION

This research successfully demonstrates that traditional fishing and herbal product communities can achieve significant economic empowerment through strategically designed digital transformation initiatives. The Pulau Ketam intervention resulted in measurable improvements across multiple indicators including 45% average income increases, 78% successful digital adoption rates, and RM 2.3 million in additional community economic activity over six months. The integrated digital empowerment framework developed through this research provides a replicable model combining infrastructure development, capacity building, market access facilitation, and sustainable community partnerships. Key success factors include culturally appropriate training delivery, community ownership of transformation processes, preservation of traditional knowledge alongside digital integration, and establishment of sustainable institutional support systems.

The research reveals that digital transformation, when properly implemented, can strengthen rather than threaten traditional cultural practices and knowledge systems. Digital documentation and marketing activities created new incentives for cultural preservation while expanding economic opportunities beyond traditional limitations. Critical insights for future implementations include the importance of multilingual, culturally sensitive training approaches; the need for reliable technical infrastructure and backup systems; the value of peer-to-peer learning networks within communities; and the potential for women's enhanced economic participation through digital commerce opportunities. Future research directions should explore long-term sustainability of digital empowerment initiatives, replication of the framework in different cultural and geographic contexts, integration of emerging technologies such as artificial intelligence and blockchain in community development applications, and development of policy frameworks supporting traditional community digital transformation at national and regional levels. The Pulau Ketam model demonstrates that the digital divide can be successfully bridged when interventions prioritize community participation, cultural respect, and sustainable development principles. This research contributes to the growing body of knowledge on inclusive digital transformation and provides practical guidance for practitioners working with traditional communities across Southeast Asia and beyond.

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FROM TRADITIONAL TO DIGITAL: ECONOMIC EMPOWERMENT MODEL FOR SEAFOOD AND HERBAL PRODUCT COMMUNITIES IN PULAU KETAM

Dian Septiana Sari *et al*

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