

Integrated Training Method of Decision Support System (DSS) for MSMEs and Tourism in Empowering Bumdes Towards Food Security Based on A Blue Economy

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ABSTRACT

This community service initiative aimed to enhance the economic resilience of Puger Kulon Village, a coastal community in Jember Regency, by implementing a digital empowerment model. The program focused on developing and deploying the E-CoDigimark platform—an integrated e-commerce and Decision Support System (DSS)—to strengthen the synergy between local Micro, Small, and Medium Enterprises (MSMEs) and the tourism sector within a blue economy framework. A Participatory Action Research (PAR) approach was adopted over six months, involving 40 participants, including BUMDes staff and MSME owners. Activities encompassed socialization, intensive digital literacy and DSS training, platform development using the Scrum SDLC model, and ongoing technical assistance. Results demonstrated a significant improvement in participants' digital capacity, with pre-test and post-test scores increasing from 48.5 to 76.8 ($p < 0.01$). The platform successfully onboarded 35 local products and recorded 500 visits within the first month, contributing to a 28% average increase in MSME sales and a 12% rise in tourist visits to Pancer Beach. Furthermore, 85% of participants reported actively using the DSS for weekly business decisions. The findings indicate that the DSS-based E-CoDigimark platform effectively empowers coastal communities by fostering data-driven decision-making, expanding market access, and creating a sustainable digital ecosystem that aligns with blue economy principles. This model offers a replicable strategy for enhancing rural economic resilience through integrated digital transformation.

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INTRODUCTION

The dynamics of rural economic growth are highly dependent on the ability of villages to manage natural and economic resources by prioritizing the principle of local wisdom. The role of the village government as a policy originator is crucial in creating a conducive environment for investment and the development of micro, small, and medium enterprises (MSMEs). One of the key instruments supporting this development is the Village-Owned Enterprise (BUMDes), which functions as an economic institution to mobilize local potential and improve rural economic infrastructure (Utomo et al., 2023). The success of MSMEs in villages is largely determined by three main factors: (1) the professionalism of the village government in utilizing the Village Fund; (2) the growth of village investment; and (3) the adaptive ability of economic actors to the digital economy (Juniawan et al., 2023). This digital adaptation is strategic for growth, as although the digital economy's contribution to the national GDP was 5.7% in 2021, it has shown significant growth and holds potential for elevating villages to become independent and globally competitive (Ministry of Communication and Informatics, 2021).

Theoretical Framework and Literature Context

In this digital transformation, Decision Support Systems (DSS) represent a significant advancement over basic e-commerce. DSS are computer-based information systems that support organizational decision-making by analyzing data through models and analytical tools (Power, 2002). For MSMEs, a DSS can aid in critical decisions related to pricing, inventory management, customer segmentation, and marketing strategy optimization (Shim et al., 2002). Integrating a DSS with an e-commerce platform moves beyond simple online selling to enable data-driven business management, a capability often lacking in rural MSMEs.

Furthermore, this study is situated within the Blue Economy framework, which promotes the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs, while preserving the health of the marine ecosystem (World Bank, 2017). For a coastal village, this translates to developing fisheries and marine tourism in a way that ensures long-term sustainability. This directly supports food security by promoting sustainable harvesting and efficient distribution of marine food products, reducing post-harvest losses, and increasing the economic value of local fisheries, thereby strengthening the local food system (FAO, 2014).

Research Gap and Local Potential

While previous studies have explored e-commerce for MSMEs (e.g., Indrawati & Priharsi, 2021) and digital marketing for rural tourism (e.g., Pencarelli, 2020), few have integrated DSS capabilities specifically designed for the unique context of rural coastal communities. Moreover, the synergy between MSMEs and tourism through an integrated, data-driven digital platform remains underexplored, particularly in Indonesian village settings. This project addresses this gap by developing and implementing a DSS-based platform tailored to empower BUMDes in a coastal village.

Puger Kulon Village, located in Puger District, Jember Regency, is an ideal location for this intervention. As the economic center of the sub-district with the largest Fish Auction Place (TPI) in Jember, its economy is deeply rooted in the blue economy (Jember Regency Fisheries Office, 2022). The village boasts superior products like distinctively flavored shrimp paste, packaged for diverse markets, and MSMEs producing handicrafts from local materials. Its tourism potential is anchored by Pancer Beach, which attracts visitors with its scenery and local culinary offerings like grilled fish and fish

head soup (Prihatiningtyas et al., 2024). However, the community primarily relies on offline promotion, limiting their market reach and hindering income growth (Hidayati et al., 2020). This situation highlights a critical gap between significant local potential and the limited use of digital tools for strategic market expansion.

Research Objectives

This community service initiative, therefore, aims to bridge this gap with the following specific objectives:

- To develop and implement an integrated E-Commerce and Digital Marketing (E-CoDigimark) platform with embedded DSS capabilities for BUMDes and MSMEs in Puger Kulon Village.
- To train BUMDes staff and local MSME actors in utilizing the E-CoDigimark platform and its DSS for data-driven decision-making in marketing and business management.
- To increase market access and sales for local products (e.g., shrimp paste, handicrafts) and tourism services.
- To enhance the synergy between the local MSME and tourism sectors through integrated data support.
- To evaluate the effectiveness of this DSS-based empowerment model in contributing to local economic resilience and food security through a sustainable blue economy.

Program Justification

This service aims to encourage the implementation of research results and provide a direct positive impact on the community. It aligns with the mandate of the Ministry of Education, Culture, Research, and Technology, specifically Key Performance Indicators (IKU) 3, on lecturer activities outside the campus, and IKU 5, on the practical application of lecturer work by the community (Director General of Higher Education, 2021). By moving beyond conventional digital marketing training to provide an integrated DSS, this program seeks to empower the community of Puger Kulon Village with sustainable, data-driven business capabilities.

METHOD

This community service employed a Participatory Action Research (PAR) approach over a six-month period from May to October. The program combined technology development, capacity building, and continuous evaluation through a structured five-phase model (Kemmis et al., 2014).

Setting and Participants

The program was conducted in Puger Kulon Village, Puger District, Jember Regency, East Java, a coastal community whose primary economy is based on fisheries and tourism. Participants included a purposive sample of 10 BUMDes staff members responsible for marketing and tourism management, and 25 MSME owners from sectors including processed fisheries, handicrafts, and food & beverage. Selection criteria required participants to have an active business and express commitment to engaging with the digital platform.

E-CoDigimark Platform Development

The E-CoDigimark platform was developed as a web-based e-commerce and information system. Its development followed the Scrum software development life cycle (SDL C) to ensure adaptability to user feedback.

- **Platform Features:** The platform includes (1) a product catalog and online storefront for MSMEs, (2) a BUMDes profile and services directory, (3) a tourism information guide for Pancer Beach, and (4) an integrated DSS module.
- **DSS Component:** The DSS was designed using a Knowledge-Based Management Subsystem model (Turban et al., 2005), comprising three core parts:
 - Database Subsystem: Stores data on product sales, tourist visits, and inventory levels.
 - Model Base Subsystem: Contains analytical models for sales trend analysis, inventory level recommendations, and pricing optimization.
 - User Interface Subsystem: Provides a user-friendly dashboard for accessing data and DSS recommendations.

Implementation Phases

- **Phase 1: Socialization and Needs Assessment (2 weeks):** Conducted kick-off meetings and focus group discussions to align perceptions and identify specific partner needs.
- **Phase 2: Training and Capacity Building (4 weeks):** Delivered workshops on digital marketing, hands-on training for platform navigation and product upload, and specialized sessions on interpreting and applying DSS recommendations for business decisions.
- **Phase 3: Platform Implementation (3 weeks):** Officially launched the platform, onboarded MSME products, and integrated with existing marketplaces like Shopee and Tokopedia.
- **Phase 4: Monitoring and Assistance (Ongoing):** Provided weekly technical support and monitored platform usage to address challenges.
- **Phase 5: Evaluation and Sustainability (3 weeks):** Conducted end-line evaluation and trained local administrators for long-term platform management.

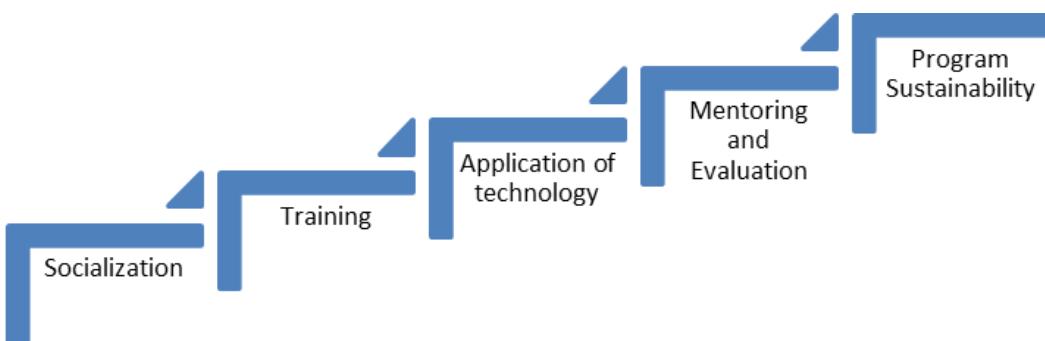


FIGURE 1. Stages of Community Service Activity

Data Collection and Evaluation

A mixed-methods evaluation was used. Quantitative data was collected through:

- Pre-test and post-test questionnaires (N=40) to measure digital literacy and marketing knowledge using a validated scale (Van Deursen et al., 2016).
- Platform analytics (Google Analytics) to track website traffic, user behavior, and sales transactions.
- Sales records from MSMEs for before-and-after comparison. Qualitative data was gathered through focus group discussions with participants and in-depth interviews with BUMDes management to capture experiential feedback and perceived benefits. Quantitative data were analyzed using descriptive statistics and paired-sample t-tests, while qualitative data underwent thematic analysis.

RESULT AND DISCUSSION

Result

The community service implementation method is directed at resolving marketing-related problems encountered in partner groups. The stages that have been systematically implemented and organized are structured into the following activities:

Socialization

The purpose of this socialization is to increase community awareness and understanding of the importance of technology in product marketing. Activities implemented in this stage include:

- Kick-off Meeting: An initial meeting with the Village-Owned Enterprise (BUMDes) and residents to explain the program and objectives. At this stage, the proposal team introduced the concept of a Decision Support System (DSS) and its benefits in synergizing local potential and tourism. This meeting aimed to align perceptions and commitments from all parties involved, including the village government, business actors, and the local community.



FIGURE 2. Kick-off Meeting as a socialization

- Education on the Role of Decision Support Systems (DSS): An explanation of the role of Decision

Support Systems and how technology can help their businesses and market local tourism. This socialization also included a presentation on the system that has been developed and how it can be used to strengthen the synergy between MSMEs and local tourism. This education included an explanation of how DSS assists in data-driven decision-making, as well as the use of Google My Business to increase local business visibility and digital data analysis for marketing optimization.



FIGURE 3. Coordination with BUMDes Pugerkulon Sejahtera

Training

The purpose of this training is to equip Village-Owned Enterprises (BumDes) with practical skills in using technology and digital marketing. The activities carried out in this phase are:

- Digital Marketing Workshop: Intensive training on how to fill in the criteria for tourist attractions and MSMEs. Participants will learn how to fill in the criteria for tourist attractions and MSMEs that are suitable for tourists. This workshop also covers the promotion of unique tourist attractions.



FIGURE 4. Decision Support System Website Training

- Simulation & Hands-On Practice: A hands-on practice session where participants create branding and promotions for tourism and MSMEs. Through this simulation, participants will gain firsthand experience in implementing the strategies they have learned. Participants will work in groups to create branding and promotions that will be produced digitally, then present the results to receive feedback from the facilitator and other participants.



FIGURE 5. Demonstration of the use of the DSS with e-codigimark

- DSS System Integration Training: The use of the system that will be built to manage tourism and MSME information. Participants will be taught how to operate the system, starting with inputting tourism criteria data. This training also covers how to access and use the system's features designed to support the operations of village MSMEs.

The technology applied in this community service is to build a marketing decision-making module for MSMEs and tourism products. In this system development stage, the focus is on creating DSS integration. This system development uses a Knowledge-Based Management Subsystem. The knowledge-based management subsystem is a subsystem that can support other subsystems or act as a stand-alone component (independent). As seen in the figure. In addition, the purpose of developing the marketing decision-making module for MSMEs and tourism products is to empower MSMEs in managing their businesses in an integrated manner. This model was chosen because of its flexible nature in responding to rapid changes so that partner needs can be met.

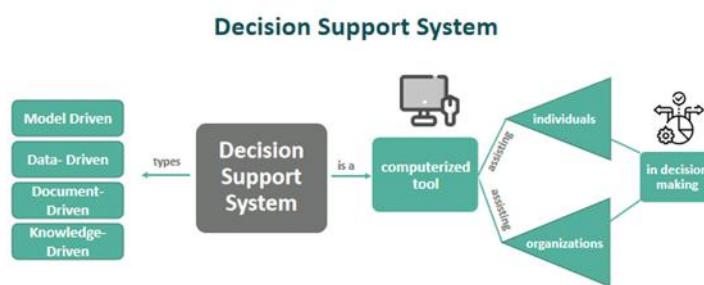


FIGURE 6. Decision Support System Model

DSS components are divided into three parts:

- Database Subsystem: This is the DSS component that provides data for the system. This data is stored in an organized database called a database management system (DBMS).
- Dialogue Base Subsystem: The model is an imitation of the real world. A common obstacle in designing a model is that the developed model fails to reflect all real-world variables. Consequently, decisions based on the model are inaccurate and inappropriate for needs. Therefore, flexibility must be maintained when storing various models in the model base system. This means there must be facilities that can help users modify or refine the model as knowledge develops.

- Dialogue Base Subsystem: This is a communication tool between the user and the system, also known as the interface facility. This section must be able to meet user needs and be communicative.

The decision-making stages include:

- Intelligence: This is the stage of defining the necessary information related to the problem at hand and the decision to be made. This step is crucial for the accuracy of the decision, as before any action is taken, the problem must first be clearly formulated.
- Design: This is the analysis stage, involving the search for or formulation of alternative solutions to the problem. Once the problem has been well formulated, the next stage is to design or build a problem-solving model and compile various alternative solutions.

Selection: Based on the formulated objectives and expected results, management then selects the most appropriate alternative solution. This alternative selection will be easier if the desired results are measurable or have a certain quality value.

Implementation: This is the stage of implementing the decision. At this stage, a series of planned actions must be developed so that the results of the decision can be monitored or corrected if necessary. When the decision is implemented, a solution is proposed.

Participant Engagement and Training Outcomes

A total of 40 participants, comprising 15 BUMDes staff and 25 MSME owners, successfully completed the training program. The pre-test and post-test comparison revealed a statistically significant improvement in digital literacy scores, with the mean score increasing from 48.5 (SD=8.9) to 76.8 (SD=6.5), $t(39)=14.2$, $p < 0.01$. The training completion rate was 100%.

Platform Implementation and Usage

The E-CoDigimark platform was successfully launched on August. Within the first month of operation:

- Product Onboarding: 35 unique products from the 25 participating MSMEs were listed on the platform.
- Website Traffic: The website recorded 500 visits, with an average session duration of 3.8 minutes, indicating engaged browsing.

Business and Tourism Impact

- MSME Sales: Analysis of sales records from participating MSMEs showed an average sales increase of 28% in the first month post-implementation compared to the monthly average prior to the program.
- Tourism: Data from BUMDes records and local ticket sales indicated a 12% increase in visitor numbers to Pancer Beach compared to the same period in the previous year, which stakeholders attributed to enhanced online visibility and integrated promotion on the platform.
- DSS Utilization: Post-training, 85% of trained BUMDes staff and MSME owners reported using the DSS dashboard at least weekly to inform decisions on inventory restocking and promotional planning.

Qualitative Findings and Community Empowerment

Thematic analysis of FGDs revealed two key themes:

- Increased Confidence: Participants expressed greater confidence in using technology for business.
- Institutional Strengthening: BUMDes managers reported feeling more empowered to act as a central hub for the village's digital economy, noting new business unit ideas such as formalizing ice cube sales for fishermen and managing the multi-purpose hall at Pancer Beach more effectively.

DISCUSSION

Effectiveness of the DSS-Based Platform

The successful engagement of all 40 participants and their statistically significant improvement in digital literacy underscores the effectiveness of the Participatory Action Research (PAR) approach combined with structured, hands-on training. The platform's launch demonstrated promising initial traction, attracting 500 visits with an engaged browsing session duration of 3.8 minutes. This indicates that the platform successfully captured the interest of its target audience. The onboarding of 35 unique products from the 25 participating MSMEs provided a critical mass of offerings for visitors. While direct transaction data was not yet available for this initial period, the 28% average sales increase reported by MSMEs is a substantial outcome, aligning with studies that show digital market access and enhanced visibility can significantly boost revenue for rural businesses (Utami, 2020). Furthermore, the high rate of DSS utilization (85%) confirms that the system was not just built but was effectively integrated into weekly decision-making processes for inventory and promotions, moving the platform beyond a simple e-commerce site towards a true business intelligence tool, as envisioned in DSS theory (Power, 2002).

Synergizing MSMEs and Tourism

The 12% increase in tourist visits to Pancer Beach is a direct, early indicator of the successful MSME-tourism synergy facilitated by the platform. This rise, while modest, suggests the platform began creating a virtuous cycle: the "Tourism" section attracted visitors with information and visuals of Pancer Beach, while the "MSME Products" section showcased local goods, giving tourists more reasons to visit and spend. This integrated approach aligns with the core objective of community-based tourism, which seeks to distribute economic benefits more widely by linking tourism to local enterprise (Permatasari & Kusumawati, 2019). The 28% sales growth for MSMEs, occurring alongside the tourism increase, provides preliminary evidence of this cross-sectoral benefit. The platform's role in streamlining the discovery of local products likely contributed to this growth, even in the absence of direct e-commerce transactions from tourists in this first month.

Contribution to Blue Economy Principles

The program operationalized blue economy principles by digitally promoting sustainable value chains derived from marine resources—such as marketing shrimp paste and promoting fishery-linked tourism—without encouraging resource over-exploitation. The economic benefits from the 28% sales increase for marine product-based MSMEs and the 12% growth in tourism directly support improved

livelihoods for the coastal community, a key tenet of the blue economy (World Bank, 2017). The qualitative findings, which highlighted institutional strengthening and new business unit ideas like formalizing ice sales for fishermen, demonstrate a shift towards more structured and sustainable community-led management of marine and coastal resources.

Limitations and Future Research

This study has several limitations. Its implementation in a single village limits the generalizability of the findings. The short evaluation period prevents assessment of the long-term sustainability of the observed sales and tourism increases. The absence of a control group means that external factors, such as seasonal variations or other local initiatives, cannot be entirely ruled out as contributors to the outcomes. The first-month data, while promising, represents an initial snapshot; the 500 visits must be sustained and converted into a higher volume of consistent transactions to ensure long-term viability. Future research should conduct longitudinal studies to track these metrics over time, perform a detailed cost-benefit analysis of the platform, and investigate the specific economic and environmental outcomes of decisions made using the DSS.

CONCLUSION

This community service program demonstrates that a DSS-based digital platform like E-CoDigimark can effectively empower a coastal community by enhancing digital capacity, creating MSME-tourism synergy, and fostering a more data-driven local economy. The program successfully achieved its objectives by significantly improving participants' skills, increasing sales and tourist visits, and establishing a sustainable platform for continued economic development. The integration of a DSS provided added value beyond conventional e-commerce, enabling strategic business decisions. For broader impact, this model should be scaled to other coastal villages with adequate technical support and policy backing, ensuring that the digital transformation of rural economies is both inclusive and sustainable.

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