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Optimizing the Performance of MSMEs in South Ambesia Village Through the Implementation of a Renewable Energy-Based Fish Capture and Marketing Information System (SITANPAS)

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ABSTRACT

This study aims to analyze whether the implementation of the Fishermen's Fish Capture and Marketing Information System (SITANPAS) based on renewable energy can increase the satisfaction of MSME fishermen in South Ambesia Village. The approach used is quantitative with the PLS-SEM method using WarpPLS software. Data were obtained from active SITANPAS user fishermen through a 1–5 Likert scale questionnaire using purposive sampling. The results show that the implementation of SITANPAS has a positive and significant effect on user satisfaction, with a coefficient of 0.82 ($p < 0.01$), where 67% of user satisfaction variation can be explained by the implementation of SITANPAS. All data validity tests showed excellent results, indicating that the research model is reliable. These findings indicate that investment in information technology tailored to the needs of local communities contributes significantly to increasing satisfaction and empowering fisheries MSMEs in coastal areas of Indonesia.

Keywords: SMEs, SITANPAS, renewable energy, digital marketing, South Ambesia Village.

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are an important pillar of Indonesia's economic development, with a very significant contribution at both the national and regional levels. Based on the 2023 report from the Ministry of Cooperatives and SMEs, the MSME sector contributes 61.07% of the national Gross Domestic Product (GDP) and employs up to 97% of Indonesia's workforce. This significant contribution makes MSMEs a strategic sector that needs attention in the formulation of economic strengthening policies, especially in rural areas that still face limitations in access to energy, infrastructure, and technology.

South Ambesia Village is one of the areas with great economic potential in the agriculture, fisheries, and local handicraft sectors. However, this potential has not been optimally managed because business actors, especially fishermen and seafood processors, still face various obstacles. The main problems include limited access to energy to support production activities, low managerial capacity, and weak marketing strategies that are still conventional in nature. These conditions have an impact on low productivity, high monthly operating costs, and limited competitiveness of local products in the wider market.

One strategy that has begun to be developed to address these challenges is the use of digital technology and renewable energy to support business management and the economic activities of coastal communities. The use of clean energy, such as solar power and biogas, can be a solution to reduce dependence on fossil fuels and reduce operational costs. In addition, the Sustainable Development Agenda or Sustainable Development Goals encourages the importance of technological innovation in increasing the productivity of the micro sector, particularly in goals 7 and 8, which emphasize affordable energy access and inclusive economic growth (UNDP, 2021).

However, a crucial aspect that remains a weakness in the development of the fisheries sector in these villages is the lack of an information system capable of managing production, marketing, and distribution data in an integrated manner. To address this need, the Fishermen's Catch and Marketing Information System (SITANPAS) was developed as an innovation aimed at improving the efficiency of catch recording, improving the accuracy of production information, and expanding marketing access through digital platforms (Rahman et al., 2025). The existence of this system is expected to not only increase the competitiveness of fishermen and fisheries-based MSMEs but also encourage digital transformation that can provide direct benefits to the welfare of coastal communities.

In the context of information technology implementation, the success rate of an information system is not only determined by technological sophistication, but also by the extent to which the system provides tangible benefits and meets user expectations. Therefore, it is important to measure SITANPAS user satisfaction to ensure that the system meets fishermen's needs, is easy to use, relevant to work processes, and supports productivity improvements. Measuring user satisfaction is a strategic step to evaluate the effectiveness of SITANPAS, identify system weaknesses, and provide a basis for improvement in future system development.

2. THEORETICAL FRAMEWORK AND HYPOTHESIS

2.1. End-User Computing Satisfaction (EUCS) Theory

The End-User Computing Satisfaction (EUCS) model developed by Doll & Torkzadeh (1988) is one of the most influential models in measuring user satisfaction with information systems. This model is based on the idea that the successful implementation of an information system depends not only on technological sophistication but also on the end users' perception of the benefits and convenience provided by the system. EUCS emphasizes that satisfaction is the user's emotional evaluation after interacting with the system, which reflects the extent to which the system can meet their needs, expectations, and preferences in completing certain tasks or activities.

EUCS covers five main dimensions, namely Content, Accuracy, Format, Ease of Use, and Timeliness, which are comprehensively evaluated to measure the quality and effectiveness of information systems. This model is highly relevant for use in the SITANPAS implementation research because the system is designed as a digital tool for fishermen to record their catches, monitor production, and expand marketing access. Thus, SITANPAS user satisfaction can be an indicator of whether the system has provided tangible benefits, is easy to use, and is reliable in supporting fishermen's activities

2.1.1. Content SITANPAS

The Content dimension refers to the completeness, relevance, and quality of the information generated by the system. In the context of SITANPAS, content includes data related to catch results, production volume, market prices, and marketing information available in the system. User satisfaction theory emphasizes that the more relevant information provided

by the system is to the user's needs, the more likely the system is to provide a positive experience for users. Content that is useful, accurate, and relevant to the operational context of fishermen can increase trust in the system and encourage its continued use.

2.1.2. Accuracy of SITANPAS

Information accuracy is an important element in the quality of information systems. According to information quality theory, users will be more satisfied when the system can produce data that is error-free, consistent, and accurate. In SITANPAS, accuracy relates to the validity of catch records, the suitability of production data to field conditions, and the accuracy of market price information. Inaccurate information has the potential to reduce user trust and hinder decision-making, making accuracy an important determinant that directly affects the satisfaction of fishermen as users.

2.1.3. Format of SITANPAS

The Format dimension relates to the layout of information, display structure, and ease of understanding the information presented. Interface design theory asserts that an intuitive, organized, and easy-to-read format will increase the comfort and efficiency of user interaction with the system. In the context of SITANPAS, format includes how information is displayed on the user's device screen, menu navigation, and the arrangement of visual elements that affect aesthetic perception and ease of use. A good format can reduce the cognitive load on users and provide a more satisfying user experience.

2.1.4. Ease of Use of SITANPAS

Ease of use refers to the level of ease with which users can operate a system without experiencing excessive technical complexity. The Technology Acceptance Model (TAM) theory reinforces the importance of ease of use; whereby perceived ease of use has a direct impact on users' attitudes and level of acceptance of technology. In SITANPAS, ease of use includes the ease of recording data, accessing information, managing catches, and conducting marketing publications. An easy-to-use system will reduce barriers to technology adoption by fishermen, especially for users with limited digital literacy.

2.1.5. Timeliness of SITANPAS

The timeliness dimension refers to the system's ability to provide information quickly, on time, and according to user operational needs. In information quality theory, the timeliness of information is a critical element that influences the effectiveness of decision making. SITANPAS, which is used by fishermen in daily activities such as recording catches and

accessing market information, requires data availability in real-time or at least within a consistent time frame. The faster and timelier the information provided by the system, the greater the satisfaction experienced by users in carrying out their activities.

2.2. The Effect of SITANPAS Implementation on User Satisfaction Based on the EUCS Model

Based on the End-User Computing Satisfaction (EUCS) model developed by Doll & Torkzadeh (1988), user satisfaction is influenced by five main dimensions, namely content, accuracy, format, ease of use, and timeliness. In the context of SITANPAS implementation, these five dimensions form the basis for formulating research hypotheses. The content dimension is predicted to have a positive influence on user satisfaction because the relevance and completeness of information are important factors in the system usage experience. The findings of Sari (2016), support that good information content can increase the satisfaction of village information system users. Similarly, accuracy is hypothesized to have a significant effect on SITANPAS user satisfaction, which shows that information accuracy determines the level of user trust in digital systems. Furthermore, the format dimension is assumed to have a positive effect on user satisfaction because a clear and structured interface display can increase the comfort of interaction with the system, which states that interface design contributes significantly to the experience of using MSME applications.

Additionally, ease of use is one of the strongest determinants of user satisfaction in the EUCS and TAM frameworks because it increases technology acceptance, especially among traditional fishermen with low digital literacy. The timeliness of information is also expected to raise SITANPAS user satisfaction, since fast and on-time data improves decision-making in fisheries operations. Taken together, these dimensions support the hypothesis that comprehensive SITANPAS implementation has a positive and significant effect on user satisfaction, consistent with prior findings that overall information system quality is crucial for the successful use of digital systems in public and community-based fisheries sectors.

3. RESEARCH METHODS

3.1. Research Design

This study uses a quantitative approach with the PLS-SEM method using WarpPLS to analyze the effect of SITANPAS implementation on user satisfaction, adopting the EUCS model, which includes five main dimensions: Content, Accuracy, Format, Ease of Use, and Timeliness. The research population consisted of fishermen who use SITANPAS in South Ambesia Village, and the sample was selected using purposive sampling with the following criteria: active as a fisherman, has used SITANPAS, and is willing to participate. Data were collected through a closed questionnaire with a 1–5 Likert scale that had undergone content validity testing and pilot testing to ensure the clarity of the instrument.

3.2. Data Analysis Techniques

Data analysis was conducted through several stages in WarpPLS, starting with testing the measurement model (outer model) to assess the reliability and validity of the construct using outer loadings indicators, Cronbach's Alpha, Composite Reliability, and AVE. Next, the structural model (inner model) was tested to see the significance of the paths between variables, path coefficients, t-values, p-values, and the explanatory power of the model through R^2. Additional evaluations were conducted through effect size (f^2) testing, predictive relevance (Q^2) testing, and WarpPLS model fit testing, such as APC, ARS, and AVIF, to ensure that the model was free from multicollinearity and had adequate structural fit.

The entire data collection process was conducted ethically by ensuring respondent anonymity and using the data solely for academic purposes. The results of the study were reported in tables and graphs covering descriptive statistics, reliability, validity, and estimates of the relationships between variables to provide an empirical picture of how the quality of SITANPAS implementation affects the level of satisfaction among fishermen in South Ambesia Village.

4. RESULTS AND DISCUSSION

According to Ghozali (2018), the outer model or evaluation model measurement is used to assess the validity and reliability of the model. Convergent and discriminant validity of the indicators forming the latent construct and composite reliability, as well as Cronbach's alpha for the indicator block, are forms of evaluation of the outer model with reflective indicators. Meanwhile, the outer model with formative indicators is evaluated through its substantive

content, by comparing the relative weight by looking at the significance of a construct indicator. The following are the results of the reliability and validity testing of the variable constructs.

Table 1. Results of construct reliability and validity testing on latent variables.

Laten Variable	Composite Reliability	Cronbach's Alpha	Average variances extracted
SITANPAS	0.921	0.889	0.705
User Satisfaction	0.870	0.811	0.575

The table above shows the results of reliability and construct validity testing for two latent variables, namely SITANPAS and User Satisfaction. The Composite Reliability values for both variables are greater than 0.70 (SITANPAS 0.921 and User Satisfaction 0.870), indicating that the constructions have good internal consistency. Cronbach's Alpha values are also above 0.70 (SITANPAS 0.889 and User Satisfaction 0.811), which reinforces the indication of adequate reliability in each construction. In addition, the Average Variance Extracted (AVE) value for SITANPAS is 0.705 and User Satisfaction is 0.575, both of which have met the minimum limit of 0.50, so it can be concluded that convergent validity has been achieved for both constructs.

After conducting outer model testing, which includes convergent validity, discriminant validity, composite reliability, and Cronbach's alpha, we proceeded with the inner model testing of the structural equation model. Inner model testing is structural to predict the causal relationship between latent variables.

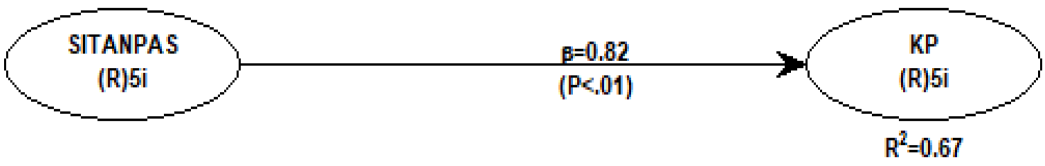

Figure 1. Full structural model.

Based on the figure, the relationship between the SITANPAS implementation variable and user satisfaction shows positive and statistically significant results. The path coefficient (β) value of 0.82 with a significance level of $p<0.01$ indicates that an increase in SITANPAS implementation contributes significantly to an increase in user satisfaction. The R2 value for the User Satisfaction variable is 0.67, meaning that 67% of the variation in user satisfaction

can be explained by the implementation of SITANPAS, which is a strong contribution figure in social research. Thus, these statistical results show a very strong, positive, and significant relationship between the two variables.

The results of tests conducted to examine several other model fit indicators, such as Average Path Coefficient (APC), Average R-Squared (ARS), Average adjusted R-Squared (AARS), Average Block VIF (AVIF), and Average Block VIF (AVIF), are presented in Table 2 below.

Table 2. Model fit indicators.

Parameter	Value	Limitations	Conclusion
Average path Coefficient (APC)	0.820 P < 0.001	p < 0,05	Model fit
Average R-squared (ARS)	0.672 P < 0.001	p < 0,05	Model fit
Average adjusted R-squared (AARS)	0.660 P < 0.001	p<0,05	Model fit
Average blockVIF (AVIF)	3.750	Acceptable if<= 5, ideally <= 3.3	Model fit
Average full collinearity VIF (AFVIF)	3.004	Acceptable if <= 5, ideally <= 3.3	Model fit
Tenenhaus GoF (GoF)	0.375	small >= 0.1, medium >= 0.25, large >=0.36	Model fit

This table shows the results of model fit evaluation in PLS-SEM analysis. All key parameters, such as Average Path Coefficient (APC), Average R-squared (ARS), and Average Adjusted R-squared (AARS), have significance values below 0.05, indicating a good fit model. The Average Block VIF (AVIF) and Average Full Collinearity VIF (AFVIF) values are both below the maximum limit of 5, indicating that there is no excessive multicollinearity in the model. The Tenenhaus Goodness of Fit (GoF) index of 0.375 is in the large category, indicating that the model is very suitable for use. All these results briefly conclude that the analyzed model has met the criteria for a good model fit.

Test results show that SITANPAS implementation has a positive and significant effect on user satisfaction, aligning with End-User Computing Satisfaction (EUCS) theory. EUCS

emphasizes that information system quality including content, accuracy, format, ease of use, and timeliness determines user satisfaction (Doll & Torkzadeh, 1988).

By integrating catch recording, production management, and marketing channels, SITANPAS improves information quality that directly addresses fishermen's operational needs, as accurate catch data reduces yield uncertainty, facilitates vessel planning, and strengthens price negotiations, while a structured interface and intuitive navigation lower cognitive load and recording time to create a smoother user experience; in addition, timely access to information is critical for weather- and market-dependent fishing activities, enabling more strategic operational and marketing decisions, and in line with the EUCS framework, these improvements in information quality and system use increase perceived benefits and ease of use, thereby raising overall user satisfaction.

Previous studies support these findings by showing that ease of use and interface design have a significant influence on MSME applications. This convergence of evidence confirms that SITANPAS, which meets key EUCS quality indicators, effectively increases fishermen's satisfaction, especially when its functions are adapted to local needs through local language formats, appropriate measurement units, and relevant pricing modules that accelerate perceived value, encourage faster adoption, and sustain continued use.

SITANPAS increases fishermen's satisfaction through four mutually reinforcing mechanisms real-time information empowers better business decisions and reduces risk, automated recording and reporting improve operational efficiency, accurate data strengthens trust and legitimacy among value chain actors, and culturally compatible design lowers adoption barriers and supports more positive user experiences. These mechanisms, supported by EUCS theory and prior empirical studies, explain the positive and significant impact of SITANPAS on user satisfaction and highlight the need for developers and stakeholders to prioritize content quality, data accuracy, locally responsive interface design, ease of use, and information speed as core strategies for sustainable adoption.

The implementation of SITANPAS in South Ambesia Village integrates marketing digitalization with previously implemented renewable energy-based processing technology, particularly solar dryer domes for dried fish production (Rahman et al., 2025). This technological combination creates synergies strengthening village product competitiveness in broader markets, enabling high-quality products with competitive pricing based on objective market data.

Multiple studies confirm smartphone application effectiveness in commercial fisheries. (Calderwood, 2022), show numerous similar applications exist for data collection and catch reporting. Supported by adequate infrastructure and strong user capabilities, these applications improve operational efficiency. Meyer et al. (2022), affirm application's benefits for fisheries management and marketing, though effectiveness depends on user engagement, reporting bias, and participant coverage. Lake Victoria's Enhanced Fish Market Information Service (EFMIS), operating for three years, increased fish trade and fisher income through real-time market access (Abila et al., 2013). Marketing as a producer-consumer connecting function requires integrated tactical strategies in applications to optimize catch management and marine product marketing.

The constraints of SITANPAS implementation can be summarized into four main issues that must be managed comprehensively to ensure system sustainability, namely dependence on fishermen's reporting compliance which creates risks of under-reporting or over-reporting when incentives are misaligned, unstable offshore communication infrastructure that hinders universal real-time reporting, limited cooperative institutional capacity for managing digital transactions in line with accounting and management standards, and data interoperability challenges when integrating SITANPAS into broader supply chains that require clear interoperability standards and information access policies, with all of these constraints forming the basis for necessary technical and policy improvements.

Table 3. Identification of implementation challenges and opportunities.

Aspect	Challenges Faced	Opportunities Generated
Technology	Internet network in offshore waters is unstable	Development of lightweight satellite-based network infrastructure
Human Resources	Older fishermen find it difficult to adapt to digital technology	The digital literacy of young fishermen can be improved in a structured manner
Institusional	Cooperatives have limited capacity to manage digital transactions	Cooperatives can develop digital-based fisheries data centers
Markets	Limited market access at local and regional scales	Integrate e-commerce platforms for market expansion

The combination of real-time recording, transparent market information, and improved product quality through renewable energy technology creates opportunities to increase market efficiency, reduce intermediary roles, and expand reach via cross-regional digital marketing, while SITANPAS data enables more accurate production planning, transparent local price reporting, and the formulation of fisheries support policies at district and provincial levels through integration with local government systems; in line with the digital fisheries economics literature, these findings confirm that well-planned digitalization can enhance productivity and market transparency when accompanied by capacity building for users and adequate infrastructure development.

The sustainable management strategy for SITANPAS emphasizes increasing human capacity through continuous, structured training and peer-to-peer mentoring adapted to fishermen's digital literacy, strengthening communication infrastructure by exploring and implementing light satellite technologies to improve offshore connectivity, developing an integrated cooperative back-office module to manage digital transactions efficiently and in line with applicable accounting standards, and testing market integration by piloting SITANPAS linkage with broader marketing platforms including e-commerce, so that overall system stability and performance improve, the economic impact at community level increases, and SITANPAS evolves into a digital transformation platform that empowers fishing communities and supports sustainable economic development in Indonesia's coastal regions.

5. CONCLUSION

The results of the study indicate that the implementation of the Fishermen's Fish Capture and Marketing Information System (SITANPAS) based on renewable energy has a positive and significant effect on the satisfaction of fishermen users in South Ambesia Village, with a path coefficient of 0.82 and an R^2 value of 0.67, indicating that the implementation of SITANPAS explains 67% of the variation in user satisfaction. All model feasibility indicators, including reliability, validity, and structural model feasibility measures in PLS-SEM analysis, were in the good category, so the model was declared reliable in explaining the relationship between the quality of SITANPAS implementation and user satisfaction. These findings confirm that information technology investments designed to meet local needs, particularly using renewable energy and integrated information systems, can increase satisfaction and contribute to the empowerment of fisheries MSMEs in coastal areas of Indonesia.

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