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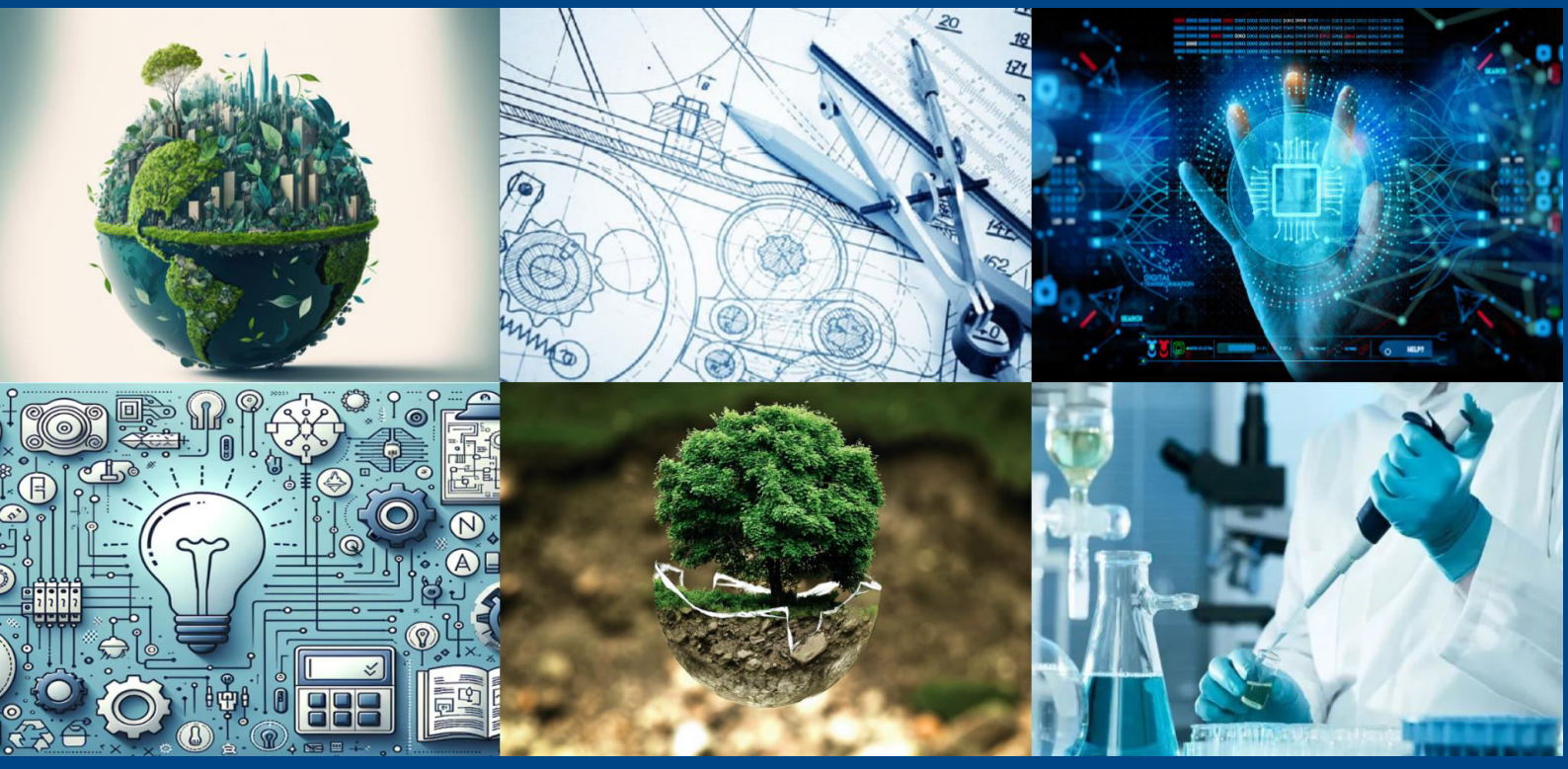

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BAHANDI: An Integrated Smart Tourism and Agri-Marketplace System for Local Sustainable Development

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ABSTRACT: This study developed and evaluated BAHANDI, an integrated smart tourism and agri-marketplace platform designed for the Municipality of Lanuza, Surigao del Sur. The system aimed to improve tourism accessibility, local product promotion, and farmer-to-consumer transactions through a unified digital platform. The study utilized a descriptive-developmental research design and Agile Software Development Life Cycle methodology. Features include tourism booking, agricultural marketplace services, GPS-based destination guidance, recommendation systems, and centralized administration. Evaluation using ISO/IEC 25010 software quality standards revealed that the system achieved "Very Great Extent" ratings in functionality, usability, reliability, performance efficiency, maintainability, and security.

KEYWORDS: Smart Tourism, Agri-Marketplace, Real-Time GPS Tracking, Agile SDLC, ISO/IEC 25010

I. INTRODUCTION

The municipality of Lanuza in Surigao del Sur possesses rich tourism destinations and productive agricultural resources; however, both sectors still face limitations in digital accessibility and centralized management. Tourists often experience difficulty accessing updated tourism information, online booking services, and travel guidance, while local farmers struggle with product visibility, market access, and direct consumer transactions. These challenges reduce operational efficiency and limit opportunities for sustainable local development.

Several studies emphasize the importance of digital platforms in improving tourism and agricultural systems. Buhalis and Amaranggana (2022) explained that smart tourism technologies improve destination management, visitor experience, and service accessibility. Similarly, Panwar and Sahoo (2025) stated that digital agricultural marketplaces improve farmer income, reduce transaction costs, and increase market reach. Studies by Maquera et al. (2022) further showed that integrating tourism and agricultural services into a single platform promotes economic connectivity and sustainable rural development.

Despite the growing adoption of digital systems, most existing applications focus only on tourism promotion or agricultural marketing independently. Rural municipalities like Lanuza still lack a unified platform capable of integrating smart tourism functions and agricultural marketplace services simultaneously. This creates operational fragmentation and limits the ability of local stakeholders to maximize digital transformation.

To address these problems, the researchers developed BAHANDI, an integrated smart tourism and agri-marketplace platform designed to support tourism information services, online bookings, agricultural product promotion, direct farmer-to-consumer transactions, and real-time location guidance. The system also integrates recommendation, search, and sorting algorithms to improve user convenience and operational efficiency.

The study is significant because it supports local tourism promotion, improves market visibility for farmers and local sellers, strengthens digital service delivery, and contributes to the sustainable economic development of Lanuza. Furthermore, the study serves as a reference for future researchers interested in developing integrated community-based digital platforms.

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II. LITERATURE SURVEY

Digital transformation continues to improve tourism and agricultural systems worldwide through the integration of smart technologies, online marketplaces, and intelligent service platforms.

Panwar and Sahoo (2025) emphasized that digital agricultural marketplaces improve productivity, market accessibility, and farmer income by connecting producers directly to consumers through electronic systems. Morepje et al. (2024) further explained that e-commerce platforms reduce post-harvest losses and strengthen economic sustainability in rural communities.

In the tourism sector, Ionescu and Sârbu (2024) highlighted that smart tourism technologies improve visitor satisfaction through real-time information access, mobile services, and digital destination management. Lapuz et al. (2023) also stated that smart tourism initiatives contribute to economic growth and operational efficiency within rural communities.

Studies on integrated digital systems demonstrate the benefits of combining multiple services into a unified platform. Maquera et al. (2022) explained that integrating tourism and agricultural systems supports economic diversification and strengthens local participation. Raji et al. (2024) additionally found that recommendation systems and AI-powered personalization improve user satisfaction and transaction efficiency within digital marketplaces.

Local studies in the Philippines further support the development of integrated digital platforms. Rabanillo et al. (2025) found that online booking and tourism management systems improve tourism accessibility and operational efficiency. Gosela and Encarnacion (2024) emphasized that hybrid digital platforms improve coordination and resource management within community-based services.

Pilar-Labarda et al. (2023) also highlighted the importance of addressing digital accessibility and literacy challenges within rural communities to ensure successful implementation of digital systems.

Table 1. Summary of Related Literature

No.	Paper Title	Author/s	Key Points	Remarks
1	Smart Tourism Destinations	Buhalis & Amaranggana (2022)	Smart tourism technologies improve visitor experience and destination management.	Supports the tourism management features of BAHANDI.
2	Digital Agricultural Marketplaces	Panwar & Sahoo (2025)	E-marketplaces improve farmer income and market access.	Supports agri-marketplace integration.
3	Integrated Tourism and Agriculture Systems	Maquera et al. (2022)	Integrated digital systems strengthen local economic development.	Supports unified platform development.
4	AI-Powered Marketplace Personalization	Raji et al. (2024)	Recommendation systems improve transaction efficiency and user satisfaction.	Supports recommendation and search algorithms.

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No.	Paper Title	Author/s	Key Points	Remarks
5	Digitalized Booking Systems	Rabanillo et al. (2025)	Online booking systems improve tourism accessibility and coordination.	Supports booking and reservation functions.
6	Hybrid Community-Based Platforms	Gosela & Encarnacion (2024)	Integrated systems improve operational coordination and service management.	Supports hybrid platform implementation.

The reviewed literature collectively supports the development of BAHANDI by demonstrating how integrated digital systems improve tourism accessibility, agricultural marketing, operational efficiency, and sustainable community development.

III. METHODOLOGY / APPROACH

Research Design

This study utilized a descriptive-developmental research design to develop and evaluate BAHANDI, an integrated smart tourism and agri-marketplace platform for the Municipality of Lanuza. The study focused on designing, implementing, and assessing a unified digital system intended for tourists, farmers, local sellers, administrators, and other stakeholders.

The Agile Software Development Life Cycle (SDLC) was adopted as the primary development methodology. Agile development enabled iterative system refinement through continuous stakeholder feedback, allowing the researchers to improve system features, interface design, and operational performance throughout the development process.

System Features

The developed BAHANDI system integrated the following major components:

1. Smart Tourism Module

Provides destination information, booking services, tourism recommendations, and route guidance.

2. Agri-Marketplace Module

Allows farmers and local sellers to promote and sell agricultural products directly to consumers.

3. Real-Time GPS Tracking

Supports tourism location visualization, route guidance, and estimated travel information.

4. Administrative Dashboard

Enables centralized management of bookings, products, users, transactions, and system monitoring.

5. Recommendation and Search Algorithms

Improves user experience by providing personalized recommendations and efficient information retrieval.

Respondents of the Study

The respondents of the study were selected using purposive sampling and included:

- Tourists/Visitors – 10
- Farmers and Fisherfolk – 10
- Tourism Officers/Administrators – 2

Total Respondents: 22

Data Collection

Data collection was conducted through interviews, observations, consultations, prototype testing, and ISO/IEC 25010 evaluation questionnaires. Respondents evaluated the system by performing actual tasks such as destination browsing, booking services, viewing tourism locations, purchasing products, and managing system records.

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Data Analysis

The collected data were analyzed using the following statistical treatments:

1. Weighted Mean – Used to determine the level of system acceptability based on ISO/IEC 25010 quality criteria.
2. Standard Deviation – Used to measure consistency of responses.
3. Qualitative Analysis – Applied to summarize user feedback, system observations, and recommendations.

IV. RESULTS & DISCUSSION

System Features

The results revealed that the BAHANDI system successfully implemented its intended smart tourism and agri-marketplace functionalities.

Smart Tourism and Marketplace Feature

The system enabled users to access tourism information, browse destinations, view agricultural products, reserve services, and perform marketplace transactions through a unified digital platform.

Real-Time GPS Tracking Feature

The system integrated GPS and map-based technologies that allowed tourists to view destinations, access travel routes, and receive route-related guidance in real time.

Administrative Dashboard Feature

The administrative dashboard enabled centralized management of tourism listings, agricultural products, bookings, user accounts, transactions, and system monitoring.

Performance Evaluation

The developed BAHANDI system was evaluated using the ISO/IEC 25010 Software Quality Model to determine its quality, usability, reliability, and overall effectiveness. Respondents composed of tourists, farmers, sellers, and administrators evaluated the system based on the quality characteristics of functionality, reliability, usability, performance efficiency, maintainability, and security. The evaluation results revealed that the BAHANDI system achieved "Very Great Extent" ratings across all categories, indicating strong user acceptance and excellent system performance.

Table 2. Performance Evaluation of BAHANDI System

Table	Quality Characteristics	Mean	Verbal Interpretation
1	Functionality	4.83	Very Great Extent (VGE)
2	Reliability	4.82	Very Great Extent (VGE)
3	Usability	4.87	Very Great Extent (VGE)
4	Performance Efficiency	4.70	Very Great Extent (VGE)
5	Maintainability	4.80	Very Great Extent (VGE)
6	Security	4.80	Very Great Extent (VGE)
	Over-All Mean	4.80	Very Great Extent (VGE)

The evaluation results showed that the BAHANDI system obtained "Very Great Extent" ratings across all software quality characteristics. Usability received the highest mean of 4.87, indicating that users found the platform easy to

understand, navigate, and operate. Functionality and reliability also received high ratings, confirming that the system effectively performs tourism and agri-marketplace services while maintaining stable operations.

Performance efficiency obtained the lowest mean of 4.70; however, it was still interpreted as "Very Great Extent," which means that the platform remains responsive and capable of handling user requests efficiently. Maintainability and security also achieved high ratings, indicating that the system is manageable, adaptable, and protected through proper authentication and access control mechanisms. Overall, the findings confirm that BAHANDI is an effective, reliable, and user-friendly digital platform for supporting tourism and agricultural services in Lanuza.

V. CONCLUSION

The study successfully developed and evaluated BAHANDI: An Integrated Smart Tourism and Agri-Marketplace System for Local Sustainable Development. The system effectively addressed the existing challenges in tourism promotion, agricultural product marketing, booking management, and digital accessibility within the Municipality of Lanuza.

Through the integration of tourism information services, online booking, agricultural marketplace functions, GPS-based route guidance, recommendation systems, and centralized administration, BAHANDI provided a more organized, accessible, and reliable digital platform for tourists, farmers, local sellers, and administrators.

The evaluation results based on the ISO/IEC 25010 Software Quality Model confirmed that the system achieved "Very Great Extent" ratings across all software quality characteristics, including functionality, reliability, usability, performance efficiency, maintainability, and security. These findings demonstrate that the system is user-friendly, dependable, efficient, and capable of supporting sustainable tourism and agricultural operations effectively.

Therefore, BAHANDI is considered an effective and acceptable integrated digital platform that strengthens tourism accessibility, improves agricultural market visibility, and supports local sustainable development within the Municipality of Lanuza.

VI. RECOMMENDATIONS

Based on the findings and conclusions of the study, the following recommendations are presented:

1. The Municipality of Lanuza should consider adopting BAHANDI as an official digital platform for tourism promotion and agricultural marketplace services.
2. System administrators should regularly update tourism information, agricultural product listings, booking schedules, and marketplace records to ensure data accuracy and reliability.
3. The GPS and route guidance features should be further optimized to improve response time, destination accuracy, and overall system efficiency.
4. Additional dashboard analytics such as booking summaries, tourism statistics, sales reports, and inventory monitoring may be integrated to strengthen centralized management.
5. Security measures such as stronger authentication, encrypted records, audit logs, and regular database backup should continuously be improved to protect user data and transactions.
6. Training and orientation programs should be conducted for tourists, farmers, local sellers, and administrators before full implementation of the system.
7. Future developers may integrate additional features such as online payment systems, AI-powered recommendations, multilingual support, chatbot assistance, and offline map access.
8. Future researchers may conduct broader evaluations involving larger groups of respondents and different municipalities to further assess the effectiveness and scalability of the platform.

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