Development and Evaluation of Accounting Information System and Shopee Open Application Programming Interface for a Small Business, Thailand

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Abstract—This research aimed to develop and evaluate an integrated Accounting Information System (AIS) with Shopee Open API for the Ban Huai Luek Agricultural Community Enterprise in Thailand, designed to enhance financial data management efficiency and optimize online marketing operations. The research employed a mixed-method approach, combining qualitative interviews with 30 stakeholders in three groups and quantitative assessments of system effectiveness with 388 consumers and 30 farmers. Interview findings revealed diverse stakeholder needs: Enterprise members prioritized financial management and operational costs, farmers emphasized security and technology access, while customers focused on e-commerce capabilities and market positioning. The developed AIS features 41 database tables and nine core functions, incorporating Shopee's e-commerce platform through Application Programming Interface (API) integration, enabling automated product listing, inventory management, and financial calculations. System evaluation demonstrated high user satisfaction across all groups. Consumer analysis showed an overall strong approval, with security and perceived benefits ranking highest, while performance efficiency scored lowest. Farmer assessments indicated high satisfaction, with ease of use and system accuracy rated highest, though security concerns emerged during initial technology adoption. Demographic factors, particularly age and income, significantly influenced user perceptions.

Keywords—Accounting information system; e-commerce integration; agricultural community enterprise; shopee open API

I. INTRODUCTION

The digital transformation of agricultural community enterprises presents both opportunities and challenges in the contemporary business landscape. While e-commerce platforms and AIS have become instrumental in enhancing business competitiveness, many rural enterprises struggle with their implementation and integration [47]. Furthermore, the absence of systematic accounting practices presents substantial challenges in financial management and decision-making processes especially in Thailand [10]. Recent technological advances suggest integrating e-commerce platforms with accounting information systems could provide a comprehensive solution to these challenges. Contemporary research advocates for user-centric design approaches that incorporate integrated payment systems and address specific consumer needs [8]. The evolution of integration approaches, from basic API implementations to sophisticated platform-specific solutions, offers promising frameworks for development [13-15], [42]. Current research indicates that limited digital channel utilization and inadequate accounting systems significantly impact the operational efficiency and market reach of community enterprises [7]. The predominant reliance on personal social media platforms, such as Facebook and LINE applications, for product distribution reveals a critical gap in professional e-commerce implementation. Building on this foundation, this study addresses the critical gap between technological capability and practical implementation in rural agricultural settings.

Ban Huai Luek Agricultural Community Enterprise is a community-based organization focused on upland rice cultivation. In southern Thailand, particularly in Khian Sa District, Surat Thani Province, Thailand, farmers have innovatively integrated rice cultivation within rubber plantations. This agricultural practice is predominantly implemented in young rubber plantations, where trees are between 3-5 years old, as mature rubber trees create excessive shade unsuitable for rice growth [12]. The researcher empirical investigation reveals significant operational constraints within the enterprise, particularly in accounting practices and financial management. The enterprise's dependence on external governmental support for basic accounting functions, combined with limited transaction documentation and absence of formal financial statements, highlights the urgent need for systematic intervention. This situation is further complicated by inadequate cost calculation mechanisms throughout the supply chain, leading to unclear profit margins and missed opportunities for value-added product development. Therefore, this study examines the case of Ban Huai Luek Agricultural Community Enterprise, which exemplifies the challenges faced by traditional agricultural communities in adopting digital technologies. The theoretical framework for this study draws upon established models in technology adoption and consumer behavior. The Technology Acceptance Model (TAM) provides insights into user adoption patterns, while Online Consumer Behavior Theory emphasizes crucial roles of trust, security, and user experience in digital commerce [18]. These theoretical foundations are complemented by User Experience Design Principles [36] and Responsive Design concepts [24], ensuring comprehensive coverage of technical and user-centric aspects.

This research aimed to address these challenges through the development and implementation of an integrated AIS and Shopee Open API for the Ban Huai Luek Agricultural Community Enterprise, with particular emphasis on evaluating system usability from the user perspective. The study contributes to the existing literature by 1) Developing an integrated AIS and Shopee Open API for the Enterprise and 2) Evaluating the effectiveness of the AIS. This investigation not only addresses immediate practical challenges but also contributes to the broader understanding of digital transformation in rural enterprises in Thailand, potentially informing future policy and development initiatives in similar contexts.

This research makes a unique contribution to the field by developing and evaluating an integrated AIS with Shopee Open API specifically tailored for agricultural community enterprises in Thailand. Unlike previous studies that have focused on either general e-commerce development or basic accounting systems, our research bridges these domains through a platform-specific integration approach that addresses the challenges faced by rural agricultural businesses. This integrated approach not only solves immediate practical problems but also contributes to the broader understanding of technology adoption in rural enterprises, potentially informing future policy and development initiatives in similar contexts.

The content is structured into five main sections: Section I is Introduction, Section II is Literature review and relevant theoretical frameworks, Section III is Research methodology and data collection approaches, Section IV is System development results and efficiency evaluation, and Section V is Discussion and recommendations. Finally, the paper is concluded in Section VI. This research aims to demonstrate the value of digital technology integration in agricultural community enterprises and offers pathways for enhancing entrepreneurial capabilities in rural areas of Thailand.

II. LITERATURE REVIEW

AIS serve as essential tools for transforming financial data into decision-making information through transaction processing modules [3], [32]. While high-quality accounting information is crucial for organizational performance [25], [29], research on AIS development methodologies remains limited. Ibrahim and Hassan [49] proposed a framework for implementing cloud-based accounting solutions for small agricultural enterprises, highlighting benefits in terms of cost-effectiveness and accessibility to modern technology. Various development approaches exist, including RAD, Waterfall, and Oracle [27], [38], with contemporary systems leveraging web services, mobile devices, cloud computing, and business intelligence capabilities [19], [46], [58], [61]. Darma and Wijaya [50] introduced innovative concepts for implementing blockchain technology in accounting information systems for agricultural supply chains, which enhances transparency and reliability of financial data. Concurrently, Patel and Sharma [51] presented a model integrating IoT technology with accounting information systems in smart farming contexts, enabling more precise and automated monitoring of production costs and efficiency.

E-commerce facilitates online business transactions through computer networks [1], [28], offering advantages in global market access, 24/7 operational capability, and cost-effectiveness through reduced overhead expenses [20]. E-commerce system development encompasses both front-end user interface design and back-end server functionality [20], with website design being crucial for consumer satisfaction and platform success [1], [48].

Chen et al. [52] examined factors influencing consumer trust in online agricultural marketplaces across Southeast Asian countries, finding that data security and product information transparency are critical factors in establishing confidence. This aligns with Wijaya and Rahmawati's [53] research, which demonstrated that digital marketing strategies significantly impact consumers' purchasing decisions for agricultural products, particularly through comprehensive information presentation and enhanced user experience.

The TAM, developed by study [11], predicts technology adoption through two variables: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). PU represents beliefs about performance enhancement, while PEOU reflects expected ease of system use. These factors influence user attitudes and system adoption behavior.

The UTAUT, developed by study [45], integrates eight theoretical models to explain technology acceptance and usage behavior. UTAUT comprises four core determinants: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions, moderated by gender, age, experience, and voluntariness of use. In this research, UTAUT framework was applied to analyze how personal factors influence users' perceptions of website performance.

Table I shows a comparative analysis of existing integrated accounting and e-commerce systems with our proposed Ban Huai Luek AIS. As illustrated in the table, there is a clear progression from general API-based approaches [13-15], [42] to more specialized, platform-specific solutions. Each system contributes unique elements to the evolution of e-commerce and accounting integration. Previous implementations have focused primarily on general business contexts, with varying degrees of technical specificity and integration capabilities. For example, while some systems emphasize security features or sales management, others prioritize API generation or development efficiency. Our Ban Huai Luek AIS represents a more specialized implementation through focused Shopee platform integration specifically designed for agricultural community enterprises, addressing their unique operational requirements and technological constraints. The comprehensive nature of our implementation, utilizing 13 distinct development tools and multiple output formats, differentiates it from previous work that typically employed more limited technological approaches. This comparison highlights the unique contribution of our research in developing a tailored solution for agricultural community enterprises while building upon the strengths of existing systems.

TABLE I.   DEVELOPMENT OF INTEGRATED ACCOUNTING INFORMATION SYSTEM AND E-COMMERCE

Aspect	Detail	[2]	[6]	[44]	Ban Huai Luek AIS
Production and Marketing Management	Key management components in Production management, Market management, Financial and accounting management			✓	
Online Marketing and Digital Presence	Focused on online business development for Website development, Search optimization, Facebook marketing, Content marketing through advertising articles, Influencer engagement				✓
Financial Management and Accounting Systems	Emphasize the importance of proper financial management: Both short-term and long-term financial planning; Systematic fund allocation and monitoring; Implementation of formal accounting systems			✓	
	Emphasize the importance of proper financial management: Accurate and systematic accounting practices enable better business planning; Improved accounting systems contribute to overall business operations	✓			
Business Development and Capacity Building	Improvements in community enterprises: Expanded distribution channels; Enhanced business knowledge among members; Improved online marketing capabilities; Development of systematic accounting practices	✓			
Digital Transformation	Emphasize the importance of digital tools, whether through comprehensive management systems or online marketing platforms		✓		
Systematic Management	Structured management approaches, particularly in financial and accounting systems, are crucial for success	✓		✓	
Capacity Development	Highlight the importance of building member capabilities, especially in business operations and digital skills	✓			✓
Multi-channel Marketing	A trend toward integrating traditional and online marketing channels	✓			✓

TABLE II.   COMPARISON BETWEEN EXISTING STUDIES WITH OUR WORK

Aspect	[13]	[14]	[15]	[42]	Ban Huai Luek AIS
Primary Focus	API integration for accounting systems	Website-based sales accounting	API generation from open data	RESTful API for integrated accounting	E-commerce integrated accounting using API for integrated accounting from Shopee open data
Frame- work	Not specified	Laravel	Model-based approach	RESTful architecture	Laravel
Database	Not specified	MySQL	Open data sources	Not specified	MySQL
Impleme-ntation	Theoretical framework	Practical implement-ation	Automated generation	Agile development (3 sprints)	Practical implementation
Special Features	Security focus	Sales and inventory manageme-nt	Automated API generation	Development efficiency	Shopee integration
Development Tools	Not specified	Laravel, MySQL	Model-based tools	Not specified	Comprehensi-ve toolset (13 tools)
Integration Type	General API	Web-based system	Open data APIs	RESTful API	Shopee Open Platform
Target Users	General business	Trading companies	Developers	Companies	Agricultural community
Testing Methods	Not discussed	Not specified	Not specified	Black box testing	Postman, XAMPP, Black box testing
Output Formats	Not specified	Not specified	API endpoints	Not specified	Multiple (PDF, Excel, QR)

Table II shows a clear progression from general API-based approaches [2], [6], [44] to more specialized, platform-specific solutions. Each system contributes unique elements to the evolution of e-commerce and accounting integration, with AIS representing the most specialized implementation through focused integration with the Shopee platform [59-60].

Kumar and Singh [54] proposed a microservices and API Gateway integration framework for e-commerce platforms, enabling systems to achieve flexibility and scalability according to business requirements. Concurrently, Zhang et al. [55] developed API-based integration strategies for cross-platform e-commerce solutions, which reduce complexity in managing data across diverse sales channels. Supaporn and Chaisiri [56] investigated digital transformation of community enterprises in Northern Thailand, identifying critical success factors including member digital skill development, government agency support, and user-centered system design. These findings align with Thongpoon and Rakthai's [57] research, which revealed that

organic agricultural product purchasing behavior through e-commerce platforms in Thailand depends on platform credibility, ease of use, and payment channel diversity.

III.   METHODOLOGY

A Mixed method between quantitative and qualitative research was used as follows.

A. Research Participants

The study population comprised three groups: 12 enterprise members, 40 upland rice farmers in Khian Sa District, and upland rice consumers. For Objective 1, convenience sampling selected 30 participants (ten from each group: community enterprise members, upland rice farmers, and previous upland rice consumers) for interviews. For Objective 2, the sample consisted of 1) Ten community enterprise members and 2) 30 upland rice farmers, selected through purposive sampling (minimum one year of farming experience), following [39]

criteria. 3) 388 consumers with prior upland rice or health food purchasing history. The consumer sample size was determined using [39] recommendation of 384 participants for unknown population sizes. To account for potential non-responses, 400 questionnaires were distributed, yielding 388 completed returns.

B. Research Tool

The research employed two primary instruments: interview guides and system efficiency evaluation tools. The interview questions, focusing on Ban Huai Luek AIS development requirements, were validated by three accounting information technology experts, achieving an Index of Item-Objective Congruence (IOC) of 0.81. System efficiency evaluation utilized two quantitative instruments: a 29-item system usability assessment for upland rice farmers (Cronbach's alpha = 0.712) and a 27-item e-commerce efficiency evaluation for consumers (Cronbach's alpha = 0.9881). Both instruments demonstrated reliability above the 0.7 threshold established by [37], indicating strong internal consistency. The research protocol received approval from the Human Research Ethic Committee of Suratthani Rajabhat University (Ethic No. SRU-EC 2020/105) prior to data collection. Our evaluation metrics extend beyond the limited performance indicators used in previous systems [14-15]. While earlier implementations primarily measured technical performance or basic user satisfaction, our evaluation framework encompasses five distinct dimensions: functional accuracy, usability, performance efficiency, perceived benefits, and security. This multidimensional approach provides a more comprehensive assessment of both technical and user experience aspects, aligning with UTAUT principles [45] and offering greater insight into adoption factors.

C. Data Collection

A triangulation method validated findings. Data collection proceeded in two phases aligned with research objectives: Phase 1 (February 2021): In-depth interviews were conducted with three groups (ten participants each): the enterprise members, upland rice farmers, and upland rice consumers. Each interview lasted approximately 30 minutes. Phase 2 (August-September 2021): System evaluation utilized structured assessments from 30 upland rice farmers evaluating operational efficiency for famers; 388 consumers assessing e-commerce platform usability; and 12 enterprise members conducting Blackbox testing of the AIS. Each evaluation required 10-15 minutes for completion. The Blackbox testing focused on external software behavior [34-35], with 19 test cases selected based on specified requirements [24].

D. Data Analysis

The qualitative data analysis process involved systematic categorization of thematically similar data, followed by analysis and synthesis of interrelated and significant elements. The frequency of recurring themes was presented using percentage distributions. The quantitative analysis encompassed both descriptive statistics (Mean, S.D.) and advanced statistical methods, comprising t-test, f-test, pairwise comparisons utilizing the Least Significant Difference (LSD) method, and measures of distribution (skewness and kurtosis).

Unlike previous implementations [42] that evaluated systems primarily through technical testing, our approach includes comprehensive user testing across multiple stakeholder groups. This multi-stakeholder evaluation strategy captures the perspectives of all system participants—enterprise members, farmers, and consumers—providing a holistic view of system effectiveness throughout the entire agricultural value chain. This approach differs significantly from prior work that typically focused on either technical implementation [13] or single-user group perspectives [14], without considering the interconnected nature of agricultural community enterprises [41].

Data interpretation followed a five-point Likert Scale framework [23] with response options ranging from 5 (strongly agree) to 1 (strongly disagree).

E. Development Tools

Development tools include 1) Laravel Framework, a PHP language web application structure in MVC Shopee format. 2) Open Platform, a system helping applications connect with Shopee stores for data management. 3) Generate PDFs in Laravel with mPDF, which is a PHP library converting html files to PDF. 4) Excel exports and imports in Laravel. 5) PHP libraries for creating, editing, and composing images. 6) PHP QR-Code generator libraries. 7) XAMPP simulates a computer server to test programs on websites. 8) Composer manages PHP libraries to create order and safety for programs or systems developed. 9) Visual Studio Code, a free code editor for Windows and Macintosh operating systems. 10) iTerm, a command Line in MacOS operating system. 11) Git, a system platform to track, audit, and change Bitbucket source code: A service provider for storing files into the Git system via an online system. 12) Sequel Pro, a MySQL database management program for MacOS operating system. 13) Postman, a program for developing applications for testing web services, submitting a service request, and seeing the responses.

IV. RESULTS

A. Interview Results of Members of the Enterprise

Based on interview findings from members of the Enterprise found that:

1) Financial management

a) The enterprise lacks a formal accounting system for group operations basis (Participant 1).

b) Sales are conducted on an order-by-order basis (Participant 2).

c) Individual income tracking exists for rice sales, but without cost and expense accounting (Participant 1).

d) Operational Costs.

e) No tracking of utilities and operational expenses as operations are based at group leader's residence (Participants 1, 4-5).

f) Group leader currently absorbs these costs (Participant 1).

g) Occasional member fundraising for exhibitions or investments (Participants 6-7).

h) Packaging costs are not calculated due to reliance on government-donated materials (Participants 8-10).

i) Technology Adoption.

j) 90% of members acknowledge accounting importance but lack expertise.

k) Strong interest in implementing user-friendly mobile accounting information system (Participants 4-5).

l) Participant 1 stated "we need a single point of entry that can seamlessly distribute information across our entire ecosystem." Participant 3 corroborated this view, adding: "The ability to synchronize product data automatically across platforms is crucial for our operational efficiency."

*m)*Participants 6-7 stated "we need a system that can integrate financial information across multiple online platforms - Facebook, Line, Shopee, and Lazada into one central platform."

B. Interview Results of Members of Upland Rice Farmers

Based on interviews with upland rice farmers: Key Technology Concerns: 80% express security concerns; 60% lack modern technology skills; 40% have limited access to equipment and internet connectivity. Resistance to Digital Adoption: Some farmers (Farmers 3-4, 6) prefer traditional paper-based methods; Consider digital systems less practical than manual record-keeping (Farmers 7-10).

C. Interview Results of Members of Upland Rice Farmers

Based on customer interviews regarding the upland rice of the Enterprise.

1) Market positioning

a) 80% of customers identify upland rice as a specialty product for health-conscious consumers.

b) Customers 1, 3-4 suggest targeting health-conscious demographic could increase revenue.

c) Customers 2, 5-7 recommend implementing online sales channels.

d) Digital Marketing Recommendations.

e) 100% of customers support developing online marketing channels.

f) Strong demand for diverse distribution channels (Customers 8-10).

g) Request for multiple payment options, particularly Cash on Delivery (COD) (Customers 1, 5-6).

h) Security.

i) Customer 5 stated "I need a secure payment system that protects my financial information when shopping online."

j) Customer 7 stated "I need a reliable customer support system."

k) Customer 9 stated "I need that system that a reliable transaction management system e.g., transaction tracking, refund monitoring, account management tools." Based on these interview findings, the system development scope will be defined according to the following key stakeholder requirements.

D. Development Results

The results of the development of the AIS consists of 1) Use case diagram (Fig. 1); 2) Information System Development; 3) Function Development; and 4) Black Box Testing. The result

details are as follows: The AIS architecture integrates three key stakeholder groups: community enterprise members, farmers, and customers. The system's development employed an agile methodology [42], enabling iterative modifications throughout the development process to ensure optimal functionality and user requirements alignment. The AIS comprises frontend and backend interfaces. Frontend access available at https://khaorailanyai.com,requires user authentication through username/email and password credentials. Backend access available at https://khaorailanyai.com/app/login, features a dashboard displaying key metrics including Sales analytics, Order tracking, Rice purchase data, Monthly expense monitoring, Sales trend visualization, and Inventory status. The system incorporates geolocation functionality for plot management, enabling automated latitude/longitude capture with edit/delete capabilities. Core functionalities include: 1) Product management, 2) Order processing, 3) Expense tracking, 4) Customer relationship management, 5) Reporting, 6) Shopee integration, 7) Farmer management, and 8) E-commerce operations.
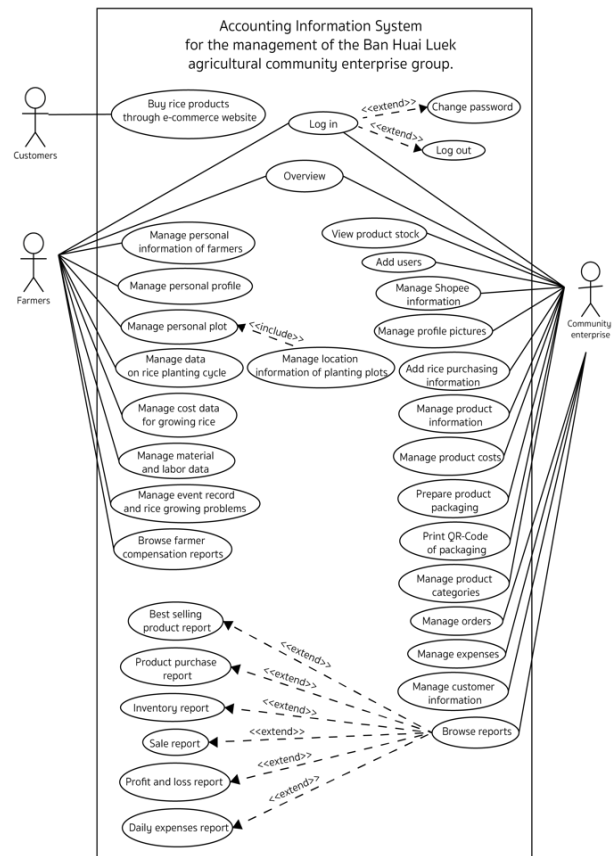

Fig. 1. Use case diagram.

A novel contribution of this research is the development of an integrated product management system facilitating seamless data synchronization between the web application and Shopee's e-commerce platform via Open API integration. This system enables automated sales data retrieval and financial analysis, including cost and profit calculations.

1) The product entry interface captures comprehensive product information including Product specifications: name,

type, details, image; Inventory metrics: price, stock quantity; Physical attributes: dimensions (width, length, height), weight; Logistics data: delivery time; Financial calculations: VAT percentage with automatic computation of pre-VAT price, VAT amount, and total price inclusive of VAT.

2) The system enables seamless product management through direct integration with Shopee's platform. Users can add products via the "Add Product" button, inputting product details and selecting appropriate categories. Product modifications and deletions are executed through dedicated edit and delete functions respectively.

3) Product cost management is facilitated through the edit function, where users can input individual cost details. Multiple cost entries can be added using the "Add cost" button, with changes confirmed via the "Save" function.

4) The packaging module facilitates product processing from raw materials through the following steps:

a) Production cycle initiation through the "Packaging" function.

b) *Input of production parameters:* production cycle details, production date, and rice species selection (system retrieves available inventory).

c) *Product processing:* product selection with automated maximum quantity calculation, multiple product processing capability, and product deletion option.

d) *Quality control:* QR code generation and printing for package tracking, automated inventory adjustment, and production list management.

The system maintains real-time inventory tracking and generates corresponding QR codes for product traceability.

5) Product types are managed through the "Add type" function, allowing input of type names with subsequent edit and delete capabilities.

Order management functionality comprises two key components:

- Order List Management:

  o Product processing: Product selection with automated maximum quantity calculation, multiple product processing capability, and product deletion option.

  o Features Shopee integration with automated order data synchronization.

  o Enables tracking number updates post-shipment.

- Order Creation:

  o Facilitates order processing for non-Shopee sales channels.

  o Allows manual order entry with contact channel specification.

The expense management module automates financial tracking through: Expense entry via "Add Expense" function; required data fields: expense type, notes, amount, payment date;

Automated total calculation; Data confirmation through save function.

Customer list shows customer names, phone numbers, and modification date. The reporting module facilitates various financial and operational analyses through date-range queries: 1) inventory status, 2) daily expenses, 3) profit and loss statements, 4) sales analytics, 5) purchase history, and 6) best-selling products. Each report type is generated by specifying date parameters and utilizing the search function.

The system integrates with Shopee's Open API to manage product listings and order information across multiple sales channels [59], [60]. Through this integration, merchants can post products directly to their Shopee shops and retrieve order data, centralizing their sales management in one platform. To connect a Shopee store, users enter their Shopee-registered phone number and complete the authorization process by 1.Clicking "Log in" followed by "Other accounts"; 2.Confirming authorization; 3. Saving the configuration. Once authorized, the system displays the store's Shopee integration status. Users can:

- Update store information via the refresh function.

- Access their Shopee storefront through the "My Shop" button.

- Navigate to Shopee's seller platform via the "Seller Center" button.

This integration capability represents a key contribution of this research, enabling streamlined multi-channel commerce management. The AIS system's architecture comprises 41 database tables, adhering to established principles of database design [21]. The system implements nine core functions: 1) Shopee API Integration, Store Information Retrieval, 3) Performance Analytics Collection, 4) Data Array Transformation, 5) Product Management, 6) Packaging Management, 7) Inventory Control, 8) Returns Processing, and 9) Shopee Product Listing. These functions form an integrated framework for comprehensive e-commerce management through the Shopee platform.

E. E-Commerce

The e-commerce platform www.khaorailanyai.com facilitates upland rice product sales through a comprehensive user interface. As shown in Fig. 2, the platform features user authentication systems and a navigation menu comprising: Home, Blog, Store, Shopping Cart, Payment Notification, Reviews, FAQ, About Us, Sign-In, and Sign-Up functionalities.

Fig. 2. E-commerce.

F. The AIS for Farmers

The AIS for farmers is a comprehensive web application comprising both frontend and backend components designed to facilitate rice cultivation management. The frontend interface is accessible to farmers via https://khaorailanyai.com, while the backend system can be accessed through https://khaorailanyai.com/app/login.The backend system incorporates six primary functionalities: 1) Dashboard visualization, 2) Farmer information management, 3) Rice cultivation cycle tracking, 3) Cost information monitoring, 4) Event logging, and 5) Report generation. Upon authentication, users are directed to a dashboard that presents consolidated metrics, including rice sales data, cost analysis, production volumes, and profit calculations. Through the farmer information module, users can maintain their personal profiles and manage plot-specific details. The system facilitates precise plot location documentation by enabling farmers to select locations on an interactive map interface and input specific latitude and longitude coordinates. The system facilitates comprehensive rice cultivation data management through an integrated interface. It enables farmers to track cultivation cycles, manage costs, and document critical production events. The platform features robust financial reporting capabilities in Excel format, incorporating detailed cost structures, production metrics, and sales analyses. A key innovation is the QR code functionality, allowing consumers to access authenticated farmer information and verify purchase data through a dual-verification system. This integration of data management and traceability mechanisms enhances operational efficiency throughout the cultivation and distribution process.

G. Evaluation Results

1) Functional testing results: The software system being tested is viewed as a "black box". The choice of test cases depends on the requirements or design specifications [33]. Functional testing focuses primarily on the external behavior [26], [31]. The results of Blackbox testing by all 12 members of the Enterprise found that all 19 functional functions passed the evaluation criteria (Table III).

2) Customer evaluation results: These results show the efficiency of the e-commerce from the consumer perspective.

a) Demographic information: A survey of 388 consumers revealed the following characteristics: Gender distribution: Most respondents were female (n=279, 71.91%), with males comprising 28.09% (n=109) of the sample. Age distribution: The predominant age group was 20-30 years (41%), followed by 31-40 years (27.06%). The least represented age group was over 60 years (0.77%). Marital status: The majority were single (77.58%), followed by married individuals (21.65%). Religious affiliation: Buddhism was the most prevalent religion (92.78%), followed by Islam (5.93%). A small proportion (1.29%) reported no religious affiliation. Educational attainment: The majority held a bachelor's degree (72.42%), followed by those with a master's degree (13.40%), and those with educational levels below a bachelor's degree (11.60%). Occupational distribution: Government officials and state enterprise employees constituted the largest group (45.10%), followed by those engaged in commerce or self-

employed businesses (22.40%). The least represented occupational category was "other occupations" (1.30%). Monthly income: The most common income bracket was 30,001 - 40,000 baht (49.20%), followed by 20,001 - 30,000 baht (31.20%). The least represented income group was those earning 50,000 baht or more per month (5.20%). Analysis of consumer purchasing channels revealed that Shopee was the most frequently used platform (56.19%), followed closely by Lazada (52.84%). Line, primarily a messaging application, was utilized by 40.72% of consumers for shopping. Instagram and traditional websites were used by 33.76% and 31.96% of respondents, respectively. Facebook was the least popular among the major platforms, used by 30.41% of consumers for e-commerce activities as can be seen in Fig. 3.

TABLE III. FUNCTIONAL TESTING RESULTS

| Functions	Test Results	Results
1. Login	A secure and reliable accounting system enhances user confidence.	Pass
2. Product management	The system offers comprehensive product management with operations and advanced search capabilities.	Pass
3. Product cost management	Self-managed product costing eliminates dependency on government assistance.	Pass
4. Packaging information management	It is much easier to manage packaging information than previously.	Pass
5. Product category management	Efficient and simplified product type administration.	Pass
6. Order management	Streamlined order management system with search, tracking, and shipping label printing capabilities.	Pass
7. Creating an order	Users can easily create orders.	Pass
8. Managing rice purchasing information	Accurate and efficient rice procurement management.	Pass
9. Expense management	Efficient and precise expense tracking system.	Pass
10. Managing customer lists	A database system enables quick customer contact and data management.	Pass
11. Managing farmer compensation reports	Efficient farmers return processing for cost analysis.	Pass
12. Inventory report management	Efficient inventory management with product traceability.	Pass
13. Managing daily expense account reports	Efficient management of daily expense accounts.	Pass
14. Managing profit and loss reports of the enterprise	Streamlined profit and loss management system for community enterprises.	Pass
15. Managing sales reports	Simplified sales report management.	Pass
16. Managing product purchase reports	Efficient and simplified purchase reporting.	Pass
17. Managing best-selling product reports	Simplified top-selling product reporting.	Pass
18. User management	The system provides secure user management with role-based access control.	Pass
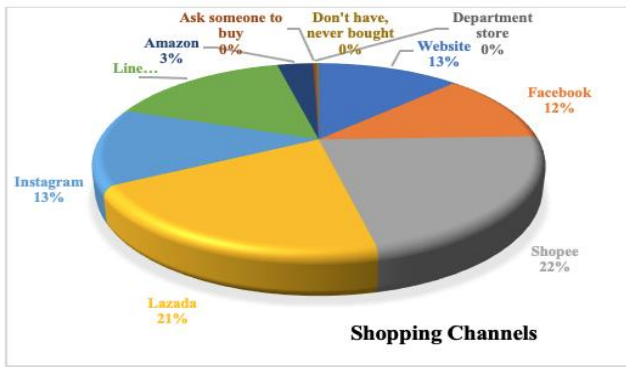
Fig. 3. The Pie chart of shopping channels.

H. Consumer Evaluation Results

Consumers expressed high levels (x̄ = 4.41) of agreement across all five dimensions of the e-commerce website usability. Security received the highest rating (x̄ = 4.44), followed by website benefits (x̄ = 4.41). Functional accuracy and ease of use were equally rated (x̄ = 4.40), while performance efficiency received the lowest, yet still high, rating (x̄ = 4.38). These results indicate a generally positive perception of the website's usability, with a particular emphasis on security features as can be seen in Fig. 4.
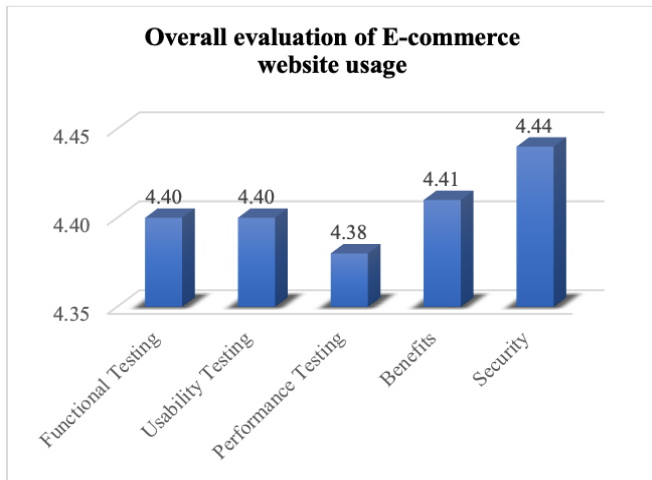

Fig. 4. Overall evaluation of E-commerce website usage.

I. Functional Testing

Table IV illustrates consumer perceptions regarding the functional accuracy of the e-commerce. An overall opinion of functional testing found average score at a high level of opinion (x̄ = 4.40). All scores were at a high level. Question 4 had the highest scores (x̄ = 4.47), followed by question 2 (x̄ = 4.40), and the least were questions 1 and 3. (x̄ = 4.37).

J. Usability Testing

Table V illustrates consumer perceptions regarding the usability of the E-Commerce. An overall opinion of Usability Testing found average score at a high level (x̄ = 4.40). It was found that all scores were at a high level. Question 4 had the highest scores (x̄ = 4.44), followed by question 2 (x̄ = 4.43), and the least were questions 1 and 8. (x̄ = 4.37).

K. Performance Testing

Table VI illustrates consumer perceptions regarding the performance of the e-commerce. An overall opinion of performance testing found average score at a high level (x̄ = 4.38). It was found that all scores were at a high level. Question 3 had the highest scores (x̄ = 4.43), followed by question 5 (x̄ = 4.42), and the least were question 2 (x̄ = 4.31).

TABLE IV. CONSUMER PERCEPTIONS OF E-COMMERCE FUNCTIONAL ACCURACY

Questions	$\bar{x}$	S.D.	Level of Agreement
1. Reports on best-selling and popular products facilitate easier purchasing decisions	4.37	0.67	High
2. Responsiveness through chat messaging increases purchase confidence	4.40	0.67	High
3. Display of remaining stock quantity expedites purchase decisions	4.37	0.71	High
4. Customer review information accelerates purchase decisions	4.47	0.65	High
Overall	**4.40**	**0.67**	**High**

TABLE V. CONSUMER PERCEPTIONS OF E-COMMERCE USABILITY

Questions	$\bar{x}$	S.D.	Level of Agreement
1. Ease of registration and E-Commerce access	4.37	0.62	High
2. Clarity of on-screen images	4.43	0.65	High
3. Readability and clarity of font size and style	4.41	0.65	High
4. Appropriateness of background color for text readability	4.44	0.63	High
5. Effectiveness of vocabulary and terminology	4.43	0.67	High
6. Ease of data input	4.41	0.68	High
7. User-friendliness of buttons, menus, and navigation	4.39	0.68	High
8. Availability of system usage instructions	4.37	0.71	High
9. Stability of marketing channels	4.38	0.68	High
Overall	**4.40**	**0.66**	**High**

TABLE VI. CONSUMER PERCEPTIONS OF E-COMMERCE PERFORMANCE

Questions	$\bar{x}$	S.D.	Level of Agreement
1. Accuracy of button and menu functionality	4.36	0.67	High
2. Presence of error notifications	4.31	0.69	High
3. Correct integration with online marketplaces	4.43	0.68	High
4. Accuracy of customer interaction data transmission	4.38	0.71	High
5. Accuracy of order calculation and payment processing	4.42	0.70	High
Overall	**4.38**	**0.69**	High

L. Benefits

Table VII illustrates consumer perceptions regarding the benefits of the e-commerce. An overall opinion of benefits

found average score at a high level (x̄ = 4.41). It was found that all scores were at a high level. Question 3 had the highest scores (x̄ = 4.45), followed by question 5 (x̄ = 4.43), and the least were question 1 (x̄ = 4.36).

TABLE VII. CONSUMER PERCEPTIONS OF E-COMMERCE BENEFITS

Questions	$\bar{x}$	S.D.	Level of Agreement
1. Comprehensiveness of product details	4.36	0.67	High
2. Facilitation of information access for decision-making	4.39	0.69	High
3. Diversity and efficiency of payment options	4.45	0.65	High
4. Rapid dissemination of store news and promotions	4.41	0.68	High
5. Simplification of the purchasing process	4.43	0.67	High
Overall	**4.41**	**0.67**	**High**

M. Security

Table VIII illustrates consumer perceptions regarding the security of the e-commerce. An overall opinion of e-commerce security found average score at a high (x̄ = 4.44). It was found that all scores were at a high level. Question 3 had the highest scores (x̄ = 4.46), followed by question 2 (x̄ = 4.44), and the least were question 1 (x̄ = 4.42). The assessment of skewness and kurtosis yielded values within the range of -1.96 to +1.96, indicating that the data conforms to a normal distribution.

TABLE VIII. CONSUMER PERCEPTIONS OF E-COMMERCE SECURITY

Questions	$\bar{x}$	S.D.	Level of Agreement
1. Implementation of user authentication system	4.42	0.62	High
2. Presence of login error notifications	4.44	0.62	High
3. Provision of secure payment channels	4.46	0.64	High
Overall	**4.44**	**0.63**	**High**

N. Testing for Differences Between Personal Factors and Perceptions

Table IX elucidates the differences in perceptions across personal factors with respect to various aspects of the e-commerce, including: functional accuracy, usability, performance efficiency, perceived benefits, and security. This analysis examines how individual demographic characteristics influence users' evaluations of these key website attributes.

1) Impact of differential personal factors on perceptions of e-commerce functional accuracy: Analysis of variance revealed that certain personal factors significantly influence perceptions of the e-commerce's functional accuracy at the .01 level of statistical significance. Specifically, age group and average monthly income emerged as significant factors. Beyond these two factors, other personal characteristics did not exhibit significant differences. Pairwise comparisons using the Least Significant Difference (LSD) method revealed the following results: a) Significant differences in perceptions were observed across various age groups: The 20-30 age group differed significantly from the 31-40 age group (p = .002). The 20-30 age group showed significant differences from the 41-50 age group (p = .014). The 20-30 age group exhibited significant differences from the 51-60 age group (p = .005). b) Significant differences in perceptions were observed across various income brackets: Consumers with monthly incomes between 10,001 - 20,000 baht differed significantly from those earning 30,001 - 40,000 baht (p = .002). The 30,001 - 40,000-baht income group showed significant differences from those earning more than 50,000 baht (p = .021). These findings indicate that income disparities result in statistically significant variations in perceptions regarding the functional accuracy of the information system. The differences were significant at the .01 and .05 levels, respectively.

TABLE IX. ANALYSIS OF VARIANCE BETWEEN PERSONAL FACTORS AND PERCEPTIONS

Personal Factors		Gender	Age	Marital Status	Religious Affiliation	Educational Attainment	Occupation	Income
SAT1	T/F test	-1.791	3.895	1.070	0.685	0.236	0.713	3.441
	sig	.074	004**	.344	.505	.872	.614	.009**
SAT2	T/F test	-1.845	3.177	1.773	0.211	1.086	1.197	3.846
	sig	.067	.014*	.171	.810	.355	. 310	.004**
SAT3	T/F test	-1.665	3.044	2.101	0.215	0.338	1.768	4.842
	sig	.098	.017*	.124	.807	.789	.118	.001**
SAT4	T/F test	-2.039	3.088	2.782	0.098	0.494	1.377	4.602
	sig	.043	.016*	.063	.907	..687	.232	. .001**
SAT5	T/F test	-1.397	2.360	1.304	0.910	0.306	0.659	2.873
	sig	.163	.053	.273	.404	.821	.655	.023*

*** is significant at the 0.00 level **is significant at the 0.01 level * is significant at the 0.05 level

2) Impact of differential personal factors on perceptions of usability: Analysis of variance revealed that certain personal factors significantly influence perceptions of e-commerce website usability. Specifically, age group and average monthly income emerged as significant factors, with differences observed at the .05 and .01 levels of statistical significance, respectively. Other personal factors did not demonstrate significant differences. Pairwise comparisons using the Least

Significant Difference (LSD) method yielded the following results: a) Significant differences in perceptions of usability were observed across various age groups: The 20-30 age group differed significantly from the 31-40 age group (p = .019). The 18-30 age group showed significant differences from the 41-50 age group (p = .028). The 18-30 age group exhibited significant differences from the 51-60 age group (p = .014). b) Significant differences in perceptions of usability were observed across various income brackets: Consumers with monthly incomes between 10,001 - 20,000 baht differed significantly from those earning 30,001 - 40,000 baht (p = .001). The 30,001 - 40,000-baht income group showed significant differences from those earning more than 50,000 baht (p = .018). The 20,001 - 30,000-baht income group exhibited significant differences from those earning more than 50,000 baht (p = .044). These findings indicate that income disparities result in statistically significant variations in perceptions of usability. The differences were significant at the .01 and .05 levels, respectively.

O. Impact of Differential Personal Factors on Perceptions of E-Commerce Performance

Analysis of variance revealed that certain personal factors significantly influence perceptions of the information system's performance. Specifically, age group and average monthly income emerged as significant factors, with differences observed at the .05 and .01 levels of statistical significance, respectively. Other personal factors did not demonstrate significant differences. Pairwise comparisons using the Least Significant Difference (LSD) method yielded the following results:

1) Significant differences in perceptions of information system performance were observed across age groups: The 20-30 age group differed significantly from the 31-40 age group (p = .015). The 18-30 age group exhibited significant differences from the 51-60 age group (p = .009). These findings indicate that age differences result in statistically significant variations in perceptions of information system performance at the .05 and .01 levels of significance, respectively.

2) Significant differences in perceptions of e-commerce performance were observed across various income brackets: Consumers with monthly incomes between 10,001 - 20,000 baht differed significantly from those earning 30,001 - 40,000 baht (p < .001). The 10,001 - 20,000 baht income group showed significant differences from the 20,001 - 30,000 baht group (p = .035). The 30,001 - 40,000 baht income group exhibited significant differences from those earning more than 50,000 baht (p = .023).

P. Impact of Differential Personal Factors on Perceptions of E-Commerce Benefits

Analysis of variance revealed certain personal factors significantly influence perceptions of e-commerce benefits. Specifically, age group and average monthly income emerged as significant factors, with differences observed at the p < .05 and p < .01 levels of statistical significance, respectively. Other personal factors did not demonstrate significant differences.

Pairwise comparisons using the Least Significant Difference (LSD) method yielded the following results:

1) Significant differences in perceptions of information system benefits were observed across age groups: The 18-30 age group differed significantly from the 31-40 age group (p = .002). The 20-30 age group exhibited significant differences from the 41-50 age group (p = .014). The 20-30 age group showed significant differences from the 51-60 age group (p = .005).

2) Significant differences in perceptions of information system benefits were observed across various income brackets: Consumers with monthly incomes between 10,001 - 20,000 baht differed significantly from those earning 30,001 - 420,000 baht (p < .001). The 10,001 - 20,000-baht income group showed significant differences from the 20,001 - 30,000-baht group (p = .048). The 30,001 - 40,000-baht income group exhibited significant differences from those earning more than 50,000 baht (p = .008). The 20,001 - 30,000-baht income group differed significantly from those earning more than 50,000 baht (p = .039). These findings indicate that income disparities result in statistically significant variations in perceptions of information system benefits at the .01 and .05 levels of significance.

Q. Impact of Differential Personal Factors on Perceptions of Security

Analysis of variance revealed that average monthly income significantly influences perceptions of security at the .05 level of statistical significance. Other personal factors did not demonstrate significant differences. Pairwise comparisons using the Least Significant Difference (LSD) method yielded the following results: Significant differences in perceptions of security were observed across various income brackets: Consumers with monthly incomes between 10,001 - 20,000 baht differed significantly from those earning 30,001 - 40,000 baht (p = .004). The 30,001 - 40,000 baht income group exhibited significant differences from those earning more than 50,000 baht (p = .018). These findings indicate that income disparities result in statistically significant variations in perceptions of security at the .01 and .05 levels of significance, respectively.

R. Farmers' Opinions on the Information System for Farmers

Farmer's opinion on the use of innovations for managing the Enterprise across all aspects, with an overall high level of agreement ($\bar{x}$ = 4.04). The highest opinion on the ease of use ($\bar{x}$ =4.11), followed by the accuracy ($\bar{x}$ = 4.07), performance and benefits are equal with $\bar{x}$ = 4.03 and least satisfied were security with ($\bar{x}$ =3.97). The details of satisfaction in each aspect are shown below.

1) Accuracy in the operation of the information system (Functional Testing): Table X shows the farmers' opinions on the accuracy of the information system for the management of the Enterprise. Overall opinions at a high level ($\bar{x}$ = 4.07), while the highest score was the system provided accurate information ($\bar{x}$ = 4.37), followed by the efficient use of the information system functions ($\bar{x}$ = 4.13), and conditional

information searches could be performed correctly ($\bar{x}$ = 4.10), respectively.

TABLE X. OPINIONS ON THE ACCURACY OF THE INFORMATION SYSTEM

System properties	$\bar{x}$	S.D.	Level of Agreement
1. Providing information correctly	4.37	0.61	High
2. Using the information system's functions can be done efficiently.	4.13	0.51	High
3. Conditional data search is performed correctly.	4.10	0.48	High
4. Accurate display of important data reports	3.93	0.45	High
5. The interaction is efficient.	3.80	0.55	High
Overall	**4.07**	**0.52**	**High**

2) The ease of use of the information system: Table XI shows the results of evaluating farmers' opinions on the ease of use of the information system. It was found that farmers generally expressed a high level of satisfaction overall ($\bar{x}$ = 4.11). The highest score of satisfaction was the appropriateness of the background color, which made the text easy to read and clear ($\bar{x}$ = 4.37). This was followed by the readability and clarity of the font size and style ($\bar{x}$ = 4.20). The visibility of images on the screen and the efficiency of vocabulary and terminology were equally rated at $\bar{x}$ = 4.17. The lowest-rated aspect was the ease of using buttons, menus, and navigation features ($\bar{x}$ = 3.93).

TABLE XI. SATISFACTION WITH THE EASE OF USE OF THE INFORMATION SYSTEM

System properties	$\bar{x}$	S.D.	Level of Agreement
1. Registration and login are easy.	3.97	0.41	High
2. The image displayed on the screen is clearly visible.	4.17	0.59	High
3. Readability and clarity of font size and style	4.20	0.41	High
4. The appropriateness of background color for text readability	4.37	0.49	High
5. The efficiency of vocabulary and terminology	4.17	0.53	High
6. Simplicity of data entry	4.10	0.61	High
7. Ease of use of buttons, menus, and navigation	3.93	0.25	High
8. Accessibility of system instructions	4.00	0.00	High
Overall	**4.11**	**0.41**	**High**

3) Performance testing: Table XII shows farmers' satisfaction with the efficiency of the information system for the management of the Enterprise. The research results found that the overall efficiency of the system was highly satisfactory ($\bar{x}$ = 4.03).While the highest score was an ability to work at full efficiency even after long-term use ($\bar{x}$ = 4.20), followed by the speed of the system response ($\bar{x}$ = 4.17).

4) Benefits of using the information system: Table XIII shows the satisfaction of farmers with the benefits of using the information system for the management of the Enterprise. It was found that overall Farmers' satisfaction was at a high-level score ($\bar{x}$ = 4.03). The highest score was with the information system that helped check the location of the planting plot ($\bar{x}$ = 4.13), followed by the information system that helped search for the desired information according to the stored categories ($\bar{x}$ = 4.07), and the information system that helped increase the convenience of recording rice planting accounts ($\bar{x}$ = 4.00), respectively.

TABLE XII. SATISFACTION WITH THE EFFICIENCY OF THE INFORMATION SYSTEM

Questions	$\bar{x}$	S.D.	Level of Agreement
1. The information system is capable of responding quickly to tasks.	4.17	0.38	High
2. The information system is stable and ready to handle errors.	3.93	0..25	High
3. The information system operates efficiently even after extended periods of use	4.20	0.41	High
4. The information system can be connected to other information systems.	3.93	0.25	High
5. The information system can support usage on the Internet network well.	3.93	0.25	High
Overall	**4.03**	**0.31**	High

TABLE XIII. SYSTEM SATISFACTION WITH BENEFITS OF USING THE INFORMATION SYSTEM

Questions	$\bar{x}$	S.D.	Level of Agreement
1. Information systems help to easily collect data on rice plantations.	3.97	0.18	High
2. Information system helps increase convenience in accounting for rice cultivation.	4.00	0.37	High
3. Information systems make it possible to search for desired information according to storage categories.	4.07	0.25	High
4. The information system helps to check the location of the plantation.	4.13	0.35	High
5. The information system can display reports on costs, profits, and sales of rice cultivation.	3.97	0.18	High
Overall	**4.03**	**0.27**	**High**

5) Security: Table XIV presents the farmers satisfaction on the security of the information system for the management of the AIS. An overall satisfaction of security of the information system shows a high-level score at $\bar{x}$ = 3.97. The highest score of farmer satisfaction was information system had a user code and password for access ($\bar{x}$ = 4.13), followed by the information system had divided user levels for access ($\bar{x}$ = 3.90), and the information system had a warning when an error occurred in entering the information system ($\bar{x}$ = 3.87), respectively.

TABLE XIV.   SATISFACTION WITH INFORMATION SYSTEM SECURITY

Questions	$\bar{x}$	S.D.	Level of Agreement
1. The information system has specified user IDs and passwords for use.	4.13	0.35	High
2. The information system has user-level permissions for access.	3.90	0.31	High
3. There is a notification when there is an error in entering the information system.	3.87	3.87	High
Overall	**3.97**	**0.33**	**High**

V.   DISCUSSION

A. The Development of the AIS

The development of the AIS used an agile software development method because researchers can edit the program at any time when they find errors during development. This results in no wasted time developing software and for completeness of software. This is in line with [43], stating that the agile software development method can go back and modify the system development at any time in the development. The AIS had been validated and reviewed from three experts considering the suitability of the software in terms of content, accuracy in using functions, and the difficulty of use before developing the information system for users to check completeness of information. This is consistent with [21] who said that in developing information systems, good database system design is required at different levels. The AIS uses PHP language for the management, using MySQL and phpMyAdmin to develop database management. It is in line with [6] who developed the system that can manage news, public relations, product information, accounting system, and member information. It is also associated with [44] who studied the management model of the silk product community enterprise , Buriram. It was found that the results of developing the management model included: 1) production management; 2) Market management; and 3) Financial and accounting management. The AIS development process consists of 1) product management; 2) order management; 3) expense management; 4) customer list; 5) report, 6) Shopee Access Permissions, 7) famer management, and 8) e-commerce. It is similar to the development of [17] which comprise of Information recognition, information recording, analysis of information and information report. Our development approach aligns with Ibrahim and Hassan's [49] framework for cloud-based accounting solutions for small agricultural enterprises, emphasizing cost-effectiveness and technology accessibility. The system's comprehensive architecture incorporating 41 database tables and nine core functions represents a more sophisticated implementation compared to previous systems, providing advanced integration capabilities specifically designed for agricultural community enterprises [41]. This comprehensive approach is consistent with Kumar and Singh's [54] microservices and API Gateway integration framework, enabling system flexibility and scalability according to business requirements. Furthermore, our implementation of Shopee's Open API for e-commerce integration aligns with Zhang et al.'s [55] API-based integration strategies for cross-platform e-commerce solutions, which reduce complexity in managing data across diverse sales channels.

B. Customers' Perception

Consumers expressed highly positive perceptions across all aspects of the e-commerce usability, with security emerging as the most critical factor. This finding aligns with [4], who identified security as a crucial determinant of trust in electronic commerce. The implementation of the internationally recognized Omise payment system corroborates the concept of [22], that reliable payment systems directly influence consumers' perceptions of security. The high importance consumers attribute to website benefits aligns with the TAM proposed by [11], which posits that PU is a critical factor in the adoption of new technologies. Furthermore, the emphasis on functional accuracy reflects the system quality, which [9] identified as one of the key determinants influencing online purchasing behavior. The research findings indicating that usability is equally important as benefits and functional accuracy align with [34] emphasizing the significance of user-friendly website design. Furthermore, these results corroborate [11], identifying PEOU as another critical factor in technology adoption. Although consumers rated performance efficiency as the least important factor, it still received a high overall score, indicating its significant role aligning with [45], which posits that Performance Expectancy is one of the key determinants influencing technology acceptance and use.

The positive consumer perceptions regarding security and system benefits align with Chen et al.'s [52] findings on factors influencing consumer trust in online agricultural marketplaces across Southeast Asia, which identified data security and product information transparency as critical factors in establishing consumer confidence. The high ratings for both usability and functional accuracy also correspond with Wijaya and Rahmawati's [53] research demonstrating that comprehensive information presentation and enhanced user experience significantly impact consumers' purchasing decisions for agricultural products. Our findings regarding the importance of diverse payment options and secure transaction systems validate Thongpoon and Rakthai's [57] research, which revealed that organic agricultural product purchasing behavior through e-commerce platforms in Thailand depends significantly on platform credibility, ease of use, and payment channel diversity.

Analysis of variance revealed differences in personal factors, specifically age group and average monthly income, significantly influence perceptions of e-commerce functional accuracy at the .01 level of statistical significance: aligning with the research of [45], that age affects technology acceptance. Furthermore, the observed impact of income differences on perceptions corresponds with [16], highlighting the influence of socioeconomic factors on Internet usage and digital technology adoption. Analysis of variance revealed that differences in personal factors, specifically age group and average monthly income, significantly influence perceptions of usability at the .05 and .01 levels of statistical significance, respectively: aligning with [11], identifying PEOU as a critical factor. Users of different ages and income levels may possess varying technological skills and experiences, potentially leading to divergent perspectives on usability. Analysis of variance revealed that differences in personal factors, specifically age group [30] and average monthly income, significantly influence

perceptions of e-commerce performance at the .05 and .01 levels of statistical significance, respectively. The difference in how people view technology fits with the UTAUT, a model developed by [45], which posits that Performance Expectancy is a crucial factor in technology acceptance. Users of different ages and income levels may have varying expectations regarding system performance, potentially leading to divergent perceptions of the e-commerce's efficiency. Analysis of variance revealed that differences in personal factors, specifically age group and average monthly income, significantly influence perceptions of information system benefits at $p < .05$ and $p < .01$ levels of statistical significance, respectively. These findings align with both [11] and [45], the UTAUT emphasize the importance of perceived usefulness. Users of different ages and income levels may have divergent perspectives and needs, potentially leading to varied perceptions of system benefits. Analysis of variance revealed that differences in average monthly income significantly influence perceptions of security at the .05 level of statistical significance: aligning with [4], highlighting security as a crucial factor in establishing trust in electronic commerce. Users with varying income levels may exhibit different degrees of concern regarding financial security.

C. Farmers' Perception

The research results found that farmers expressed positive opinions regarding the use of information systems for managing the Ban Huai Luek Agricultural Community Enterprise. This aligns with TAM [11], which suggests that perceived usefulness and perceived ease of use are important factors affecting technology acceptance. The research found that farmers had favorable opinions about both the ease of use and the benefits of using the information system. Additionally, the results were consistent with the Unified Theory of Acceptance and Use of Technology (UTAUT) [45], which states that performance expectancy and effort expectancy are important factors affecting technology acceptance. However, the results revealed that farmers had the lowest opinions regarding system security. This finding aligns with the study by [5], which found that concerns about data security were one of the major barriers to digital technology adoption among small-scale farmers. Therefore, future system development should focus on enhancing system security and building user confidence. Farmers' concerns about initial technology use are consistent with Rogers' [40] concept of diffusion of innovations, which states that the adoption of new technologies is a process that takes time and progresses through various stages. Therefore, the development of user manuals and provision of continuous training are essential to support farmers in using the system effectively.

Our findings regarding farmers' security concerns align with Darma and Wijaya's [50] research on blockchain technology implementation in agricultural supply chains, which emphasizes the importance of data security and transaction reliability. The generally positive perception of the system's functionality and benefits corresponds with Patel and Sharma's [51] model integrating IoT technology with accounting information systems in smart farming contexts, which highlights the value of precise and automated production cost monitoring. Furthermore, the observed importance of ease of use and system accuracy in farmer assessments aligns with Supaporn and Chaisiri's [56] investigation into digital transformation of community

enterprises in Northern Thailand, which identified member digital skill development and user-centered system design as critical success factors for technology adoption. The implementation of geolocation functionality and QR code traceability in our system addresses the needs for enhanced transparency and reliability in agricultural information systems as identified by both Darma and Wijaya [50] and Supaporn and Chaisiri [56].

This research presents several limitations: 1) The system development is confined to the Shopee platform, as it is the only platform providing accessible API integration capabilities, which may not encompass other online marketing channels utilized by farmers; 2) The constrained evaluation timeframe precludes comprehensive assessment of long-term impacts on business sustainability; and 3) Digital infrastructure challenges prevalent in rural areas may adversely affect system performance in real-world operational environments [62-64].

VI. CONCLUSION

Based on stakeholder interviews, key requirements for the AIS development emerged across three groups: 1) the Enterprises' members, Upland rice farmers, and Consumers informed the development of the integrated AIS that balances operational efficiency with user accessibility while maintaining robust security measures. The development of the AIS consists of 41 tables and nine main functions: 1) Connecting with Shopee; 2) Function to retrieve store information from Shopee; 3) Shopee store performance data retrieval function; 4) Function to convert data form into Array format; 5) Product recording function; 6) Packaging function; 7) Product stock cutting function; 8) Product return function and; 9) Product listing function in Shopee. This is considered as a new contribution of the research, especially the function of placing products information in Shopee stores through the developed web application. The information can pull from the Shopee platform to calculate costs and profits through Shopee Open API. The development of the information system for farmers comprises key functional areas: farmer data management, rice cultivation cycle management, cost data management, event logging, and report processing.

The customer analysis of the e-commerce, based on 388 consumer responses, revealed high satisfaction across all dimensions, with security and perceived benefits as primary concerns. The findings align with the TAM, demonstrating that demographic factors, particularly age and income, significantly influence consumer perceptions. These insights contribute to understanding rural e-commerce behavior and emphasize the importance of security measures and user benefits in website development strategies. The evaluation of 30 farmers revealed high satisfaction with the accounting information system, particularly in usability and functionality aspects. Though initial security concerns existed, these were addressed through comprehensive user documentation to support system implementation.

Future research should focus on developing an advanced Analytics Module that would enable community enterprises to monitor and analyze consumer behavior more effectively. The development of mobile applications with offline functionality would address digital infrastructure challenges in rural areas.

Additionally, comparative longitudinal studies between community enterprises that implement the system and those that do not would provide deeper insights into the economic and social impacts of such technological integration.

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