Bridging the digital divide: Enhancing community product sales through mobile technology for sustainable development

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Abstract

This study aims to develop a Mobile Application Framework (MAF) that promotes online community product sales and fosters self-reliance. Specifically, it seeks to (1) synthesize key framework components, (2) design a model that meets the needs of community producers and consumers, (3) develop the framework, and (4) evaluate its effectiveness in enhancing community self-reliance. The study is grounded in the System Development Life Cycle (SDLC) and User-Centered Design (UCD) principles, ensuring a strong focus on user needs and experiences. A mixed-methods approach was employed, integrating document analysis, in-depth unstructured interviews, and focus group discussions with three key stakeholder groups: community product sellers, mobile application experts, and experienced users. Data collection focused on identifying user requirements, preferences, and challenges, which informed the framework's design and evaluation. The research identified five core components essential for the final framework: usability requirements, accessibility, accuracy, security, and trustworthiness, with 30 detailed indicators. The findings highlight the importance of integrating sustainable development models to drive technology-enabled economic transformation and ensure long-term community sustainability. This study presents a novel framework that blends user-centered design with community-based economic practices, providing a structured approach to leveraging mobile technology for self-reliance. Its emphasis on localized solutions and stakeholder engagement differentiates it from existing models. The proposed framework offers a practical solution for empowering community entrepreneurs by enhancing their access to digital markets. By addressing key design and security factors, it fosters trust and usability, promoting wider adoption and sustained economic benefits. The study contributes to the field of digital entrepreneurship and sustainable development, offering policymakers, developers, and community leaders a structured pathway for leveraging mobile technology to drive inclusive economic growth.

1. Introduction

The global economy has undergone a rapid digital transformation post-pandemic, with businesses increasingly shifting toward e-commerce platforms and smartphone applications [1]. The widespread adoption of smartphones has significantly enhanced consumer convenience, enabling seamless access to platforms such as Lazada, Shopee, and TikTok Shop in Thailand. Consequently, businesses must adapt to digital sales strategies to maintain competitiveness and ensure sustainability [2].

Mobile applications offer diverse communication tools, including text, images, videos, and interactive media, allowing consumers to make more informed purchasing decisions, enhancing sales and customer engagement. Online marketplaces also enable consumers to compare prices, access reviews, and make purchases effortlessly, leading to a more dynamic and competitive e-commerce environment.

The Business-to-Consumer (B2C) model has also emerged as a key driver of economic growth, allowing businesses to sell directly to end-users, bypassing intermediaries. As consumer behavior evolves, businesses must strategically select appropriate digital platforms to optimize reach and sales.

2. Literature Review

2.1. Online Community Product Sales Techniques

Various studies have identified effective digital marketing strategies for entrepreneurs selling products via online platforms [3]. These include live chat support [2] online word-of-mouth marketing [4] user reviews [5] and digital marketing campaigns [6]. Social media integration further enhances consumer engagement and marketplace visibility [7].

Chen and Zhu [8] emphasize the importance of information sharing in online marketplaces, highlighting social media's role in fostering virtual business communities. However, while online marketplaces are relatively easy to join, entrepreneurs face operational challenges, including market saturation, customer trust, and logistical barriers [9]. Entrepreneurial persistence and community support are critical success factors in overcoming these challenges.

2.2. National Programs for Sustainable Development

Thailand's commitment to the United Nations Sustainable Development Goals (SDGs) is captured in its pledge to '*leave no one behind*.' The proposed online sales framework aligns with SDG 1 (No Poverty) [10] SDG 8 (Decent Work and Economic Growth) [11] and SDG 12 (Responsible Consumption and Production) [12] by promoting inclusive digital entrepreneurship

Likewise, the One Tambon One Product (OTOP) initiative, launched in 2001, has played a crucial role in supporting rural entrepreneurship [13]. Inspired by Japan's One Village One Product (OVOP) model, OTOP has fostered local economic development but has faced criticism for its top-down approach and limited scalability [14]. Despite these challenges, Suindramedhi [15] argues that OTOP's sustainability potential remains strong, particularly when integrated with modern digital commerce solutions.

2.3. Local Production Challenges

Despite the shift toward Thailand 4.0, which emphasizes innovation and digital transformation [16] local producers face barriers to financial literacy, technology adoption, product standardization, and market access. One of the biggest challenges facing community entrepreneurs is financial illiteracy. Many small-scale producers lack the skills to calculate production costs, set competitive prices, or secure business loans, limiting their ability to scale operations [17, 18].

Community-based products often reflect cultural heritage but may lack standardization, limiting their competitiveness in domestic and international markets [19]. Producers struggle to modernize designs while maintaining authenticity, creating tension between tradition and market demand [15].

Although digital platforms offer opportunities for market expansion, many local entrepreneurs lack the technical skills and infrastructure to leverage e-commerce effectively [20]. Key challenges include setting up online stores, optimizing digital marketing, and using data analytics to track customer behavior [9].

While initiatives like OTOP have enhanced visibility for local products, many entrepreneurs struggle to differentiate their offerings in a competitive marketplace. Limited brand recognition and marketing budgets further restrict their ability to expand beyond local sales [13].

Consumer preferences are shifting toward sustainable and eco-friendly products, yet many traditional production methods do not align with modern environmental standards. Sustainable packaging, ethical sourcing, and waste reduction are critical factors in market acceptance.

Despite various government programs, bureaucratic inefficiencies and lack of grassroots engagement often hinder effective implementation [13]. Policies must be more responsive to the actual needs of local producers to foster long-term sustainability.

Mobile applications offer scalable solutions to many of these challenges by providing:
- Financial management tools for improved accounting practices.
- Digital marketing platforms for greater consumer reach.
- Market linkage tools to facilitate direct sales and online networking.
- Training modules to enhance digital literacy among entrepreneurs.

By integrating these features, mobile applications can bridge the gap between traditional community enterprises and the demands of a digital economy, fostering economic growth and sustainability.

3. Research Methodology

This study adopted a Research and Development (R&D) approach [21] to explore and understand previously unknown aspects of mobile application development for promoting online community product sales. The primary goal was to gather in-depth insights into the needs, preferences, and challenges faced by community product sellers, mobile application experts, and end-users [22]. The researchers first examined recent literature relevant to online mobile apps used in community product sales to achieve this. Further qualitative methods, including in-depth interviews and focus group discussions, were employed to capture diverse perspectives and deepen the understanding of the subject matter.

3.1. Population and Sample

The research process emphasizes a holistic view, integrating the thoughts, feelings, and experiences of three key stakeholder groups:
1. Community Product Sellers: To understand their operational challenges and expectations from a mobile application [19, 20].
2. Mobile Application Experts: To gain technical insights into designing and developing user-friendly and practical mobile applications [23-25].
3. End-Users: To identify their preferences and pain points when using mobile applications for purchasing community products.

Additionally, the study evaluated expert opinions on the proposed mobile application framework to ensure its alignment to foster self-reliance among community product sellers [26]. This methodological approach ensures that the research is comprehensive and grounded in the real-world needs of its target users.

Table 1.
Research literature synthesis results.

	Awais, et al. [27]	Karakaya [28]	Fauzi [29]	Al Dmour, et al. [30]	Zhao and Balagué [31]	Salama and Anam [32]	Yavuz and Çelik [33]	Özcan and Kert [34]	Magrath and McCormick [35]	Tarute, et al. [36]	Total
1) Usability requirements	√	√	√	√	√	√	√		√	√	9
2) Accessibility		√	√		√		√		√	√	6
3) Accuracy and Precision	√			√		√		√	√		5
4) Security	√		√		√		√	√		√	6
5) Trustworthiness	√			√				√		√	4
6) User Attitudes			√			√		√			3
7) Service Quality	√			√							2
8) Utility and Benefits			√				√				2
Total	5	2	5	4	3	3	4	4	3	4	

3.2. Document Analysis

This involved carefully selecting and examining high-quality documents to extract meaningful information. The researcher recorded relevant data, either in detail or selectively, based on the research objectives. The analysis focused on identifying explicit and implicit facts within the documents (Table 1). This examination identified eight Mobile Application Framework (MAF) components for community product sales (Table 2).

Table 2.
Components for an MAF for online community product sales.

Component	Description
User Interface (UI) Design	Focus on simplicity, ease of navigation, and visual appeal to enhance user experience [37, 38].
Product Catalog Management	Enable efficient uploading, updating, and categorization of community products.
Payment Integration	Secure and diverse payment options to facilitate seamless transactions [39]
Customer Relationship Management (CRM)	Tools for tracking customer interactions, feedback, and purchase history [40-42].
Marketing and Promotion Tools	Features for discounts, promotions, and social media integration [43].
Supply Chain Integration	Coordination with local suppliers and logistics for timely product delivery.
Data Analytics	Insights into user behavior, sales trends, and product performance [44].
Community Engagement Features	Forums, reviews, and feedback mechanisms to foster user interaction.

The eight interconnected components of the MAF collectively enhance its overall effectiveness. Usability and accessibility ensure ease of use and broad adoption [38] while security and trustworthiness establish user confidence [39]. Accuracy, precision, and service quality contribute to a seamless user experience, and user attitudes, utility, and benefits align the application with user expectations [24].

A holistic approach to these components enables the framework to support community product sales while fostering self-reliance and sustainable economic growth. The next phase involves expert evaluation and user testing to refine the framework and ensure its practicality and impact.

This structured synthesis ensures that the MAF is comprehensive, user-centric, and aligned with sustainable development goals. The integrated framework was then tested for feasibility and effectiveness in promoting online community product sales and entrepreneurial self-sufficiency.

3.3. In-Depth Interviews

This method relied on structured conversations between the interviewer and interviewee. This allowed the researchers to observe verbal and non-verbal behaviors that provided additional context for interpreting responses. The interviews were unstructured, with broad guiding statements and questions that allowed maximum flexibility and adaptability during the conversation [45]. The researchers tailored the items to suit the respondent and the context, aiming to gather deep insights rather than comparing responses or testing hypotheses. The interview items were divided into three sections. These included Section 1's items concerning community product entrepreneurs, Section 2's items concerning mobile application experts, and Section 3's items concerning community product mobile applications.

3.4. Expert Feedback

The study's questionnaire used experts to evaluate the items in the proposed MAF. This questionnaire was divided into two sections. These included Section 1's opinions on the framework's development and Section 2's suggestions for improvement.

3.5. Data Analysis

Data analysis for developing the MAF for selling online products to promote self-reliance used descriptive statistics for analysis. These included the mean and standard deviation (SD). The mean scale, values, and interpretation for the five levels of possible response were '5' indicated the strongest agreement (4.50 - 5.00), followed by '4' indicating strong agreement (3.50 - 4.49), '3' indicated a moderate or neutral response (2.50 - 3.49), while '2 indicating disagreement with the item (1.50 - 2.49), and finally, a '1' indicating no agreement with the item or question (1.00 - 1.49) [46].

3.6. MAF Indicators

Based on synthesizing components, the researcher identified the six highest-ranked components for developing the mobile application framework. These components were refined into specific indicators by synthesizing insights from academic experts in Thailand and abroad. The indicators are categorized under each component as follows (Table 3):

Table 3.
Indicators for the MAF for community product sales.

Usability Requirements - Aligns interface, functionality, and responsiveness with user needs.	The application's interface design, featuring relevant content and images, aligns with user needs.
	The application's functionality is convenient and meets user expectations.
	The application includes features that directly address user requirements.
	The application's management system aligns with user needs.
	The appcation is the preferred channel for users over other alternatives.
	The application provides fast, modern, and responsive access to information and technology.
Accessibility - Ensures ease of access, navigation, and 24/7 availability.	The application is easy to access without unnecessary complexity.
	The arrangement of functions and features allows for easy navigation.
	The language and content used in the application are easy to understand.
	Users can operate the application independently with minimal guidance.
	The application is accessible 24/7 from any location and device.
	Users can review their access history to prevent errors at any time.
Accuracy and Precision - Guarantees accurate design, content, communication, and processing.	The application's design and development are accurate and precise.
	The content and language used in the application are accurate and error-free.
	Communication, interaction, and responses to user inquiries are accurate.
	Data processing within the application is precise and reliable.
	All menu interfaces display information accurately.
	The application's management processes follow accurate and precise workflows.
Security - Provides strong authentication, transaction security, and data protection.	The application includes secure user authentication and access systems.
	Users have confidence in the application's security measures.
	Communication and responses within the application are secure.
	Financial transactions, such as payments and transfers, are protected by robust security systems.
	The application ensures secure product delivery and logistics.
	The application complies with strict data protection laws to safeguard personal information.
Trustworthiness - Builds user confidence in management, accessibility, and reliability.	Users have a positive attitude and trust in the application's management system.
	Users trust the application's accessibility and usability.
	Users trust the accuracy and reliability of data processing.
	Users trust the information displayed on the application's interfaces.
	Users trust the responsiveness of the application's information, technology, and communication systems.
	The application provides comprehensive guidance to users, enabling them to understand its benefits and recommend it to others thoroughly.

These indicators are the foundation for developing and evaluating the mobile application framework. By addressing each indicator, the framework ensures the application is user-centric, secure, and reliable, fostering trust and satisfaction among community product entrepreneurs and consumers. The following steps involve integrating these indicators into the application's design and functionality, followed by expert evaluation and user testing to validate their effectiveness.

4. Results and Discussion

Developing the Mobile Application Framework (MAF) for promoting online community product sales represents a significant step toward fostering self-reliance and sustainable economic growth among community product sellers. By adopting a Research and Development (R&D) approach, this study integrated insights from three key stakeholder groups—community product sellers, mobile application experts, and end-users—to ensure the framework's alignment with real-world needs. The study identified eight critical components for the MAF's effectiveness through qualitative methods, including in-depth interviews, focus group discussions, and document analysis. These components, from usability and accessibility to security and trustworthiness, were refined into specific indicators to guide the application's design and functionality.

The iterative development process, grounded in the Software Development Life Cycle (SDLC) framework [47] ensured that the MAF is user-centric and scalable, addressing the unique challenges rural and community-based e-commerce settings face. This discussion delves into the key findings, evaluates the framework's strengths and areas for improvement, and explores its potential impact on promoting entrepreneurial self-sufficiency and community engagement.

4.1. MAF Development Results

The development of the MAF for community-based online product sales was structured using a systematic approach that incorporated:

- A literature review of existing mobile commerce applications and relevant frameworks [1, 23, 39, 42].
- A survey of experienced mobile commerce users to determine essential system features [7, 22, 48].
- Expert consultations and focus groups with community leaders, policymakers, and local entrepreneurs [3, 13, 49].

These steps ensured that the design of the mobile application met the needs of community-based enterprises (CBEs) and rural entrepreneurs and consumers [50, 51] while promoting economic self-reliance [49].

The study adopted the Software Development Life Cycle (SDLC) framework as a guide in the study's system development [47]. The key stages—requirement analysis, system design, development, testing, deployment, and maintenance—provided a structured methodology for application development.

4.2. SDLC Framework for MAF Development

Figure 1 presents the revised SDLC framework, aligning with best practices in mobile application development [47]. This framework ensures efficient system functionality, scalability, and usability, particularly in rural and community-based e-commerce settings.
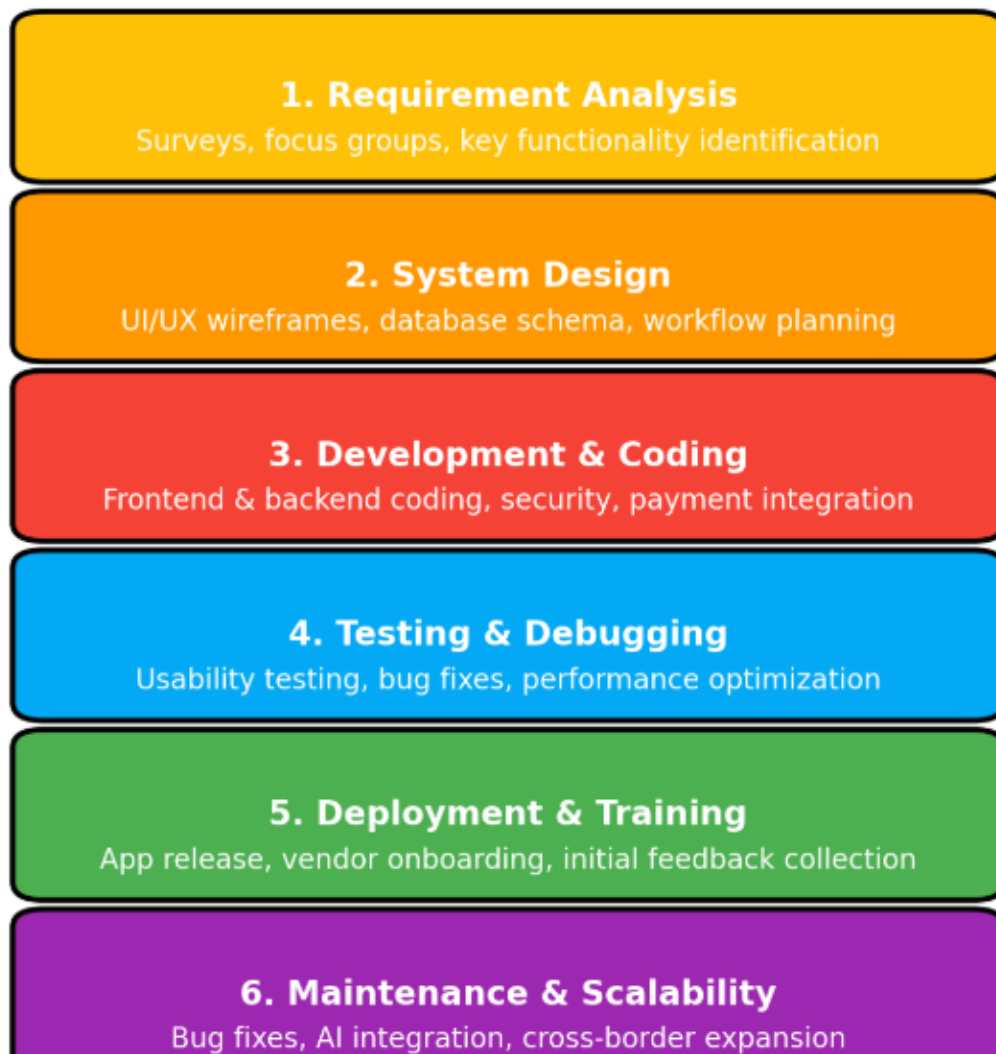

Figure 1.
MAF development map.

Table 4 illustrates the MAF development process, which outlines the iterative stages in designing, refining, and implementing the mobile commerce platform.

Table 4.
MAF development process.

SDLC Phase	Key Knowledge Required	Activities & Deliverables	Application to Community Product Sales
1. Requirement Analysis	- Business process understanding - Stakeholder needs assessment	- Conduct surveys and focus groups - Identify key functionalities - Create a requirement specification document	- Gather insights from community entrepreneurs, buyers, and system administrators
2. System Design	- UI/UX principles - Database architecture - API integration	- Design wireframes and user interface (UI) - Define database schema & relationships - Plan system workflow	- Design a mobile-friendly layout with easy navigation for rural users
3. Development & Coding	- Programming languages (Kotlin, Swift, Flutter) - Database connections - Security & authentication	- Develop front-end & back-end - Implement secure payment systems - Develop chatbot support	- Build an interactive marketplace with vendor and customer dashboards
4. Testing & Debugging	- Quality Assurance (QA) - Usability testing - Performance testing	- Conduct functional testing on all devices - Fix UI/UX inconsistencies - Test payment and logistics tracking	- Ensure the app works on low-bandwidth networks and older devices
5. Deployment & User Training	- Cloud hosting (AWS, Firebase) - User onboarding strategies	- Deploy the app to Google Play and App Store - Provide training materials for vendors - Gather initial user feedback	- Assist local entrepreneurs in setting up product listings and handling orders
6. Maintenance & Scalability	- Continuous integration & updates - AI and data analytics for recommendations	- Implement bug fixes and security patches - Optimize server response time - Introduce AI-driven product suggestions	- Expand to include cross-border e-commerce for OTOP exports

4.3. Application Design and User Roles

The mobile application was designed to support three primary user roles. These included:

Administrators (admin) - Responsible for managing platform operations, including user accounts, inventory, and transaction monitoring.

Registered members (vendors & customers) - Vendors can list products, track orders, and manage sales, while customers can browse products, make purchases, and track deliveries.

Guest users **-** non-registered users can browse products and promotions but must register to complete transactions. The application prototype underwent several evaluation stages, including:

- Expert evaluation of UI/UX design
- User testing and feedback sessions
- Refinement based on functional testing results

Figure 2 presents the finalized mobile application interface (Me-D), showcasing optimized navigation, seamless transaction features, and enhanced security protocols.

4.4. Key Evaluation Findings

The evaluation of the mobile application model among the experts shows that the platform upholds a high usability and functionality standard. The overall best rated features are:

- Cross-device compatibility (Mean = 4.47) – Usability across all screen sizes and platforms.
- Ease of use (Mean = 4.40) – Easy navigation and clear user instructions.
- Security & authentication (Mean = 4.33) – Secure login mechanism and data protection measures.

However, system flexibility (Mean = 3.89) was recognized as an area for future improvement, indicating the need for continuous scalability and future feature enhancements.
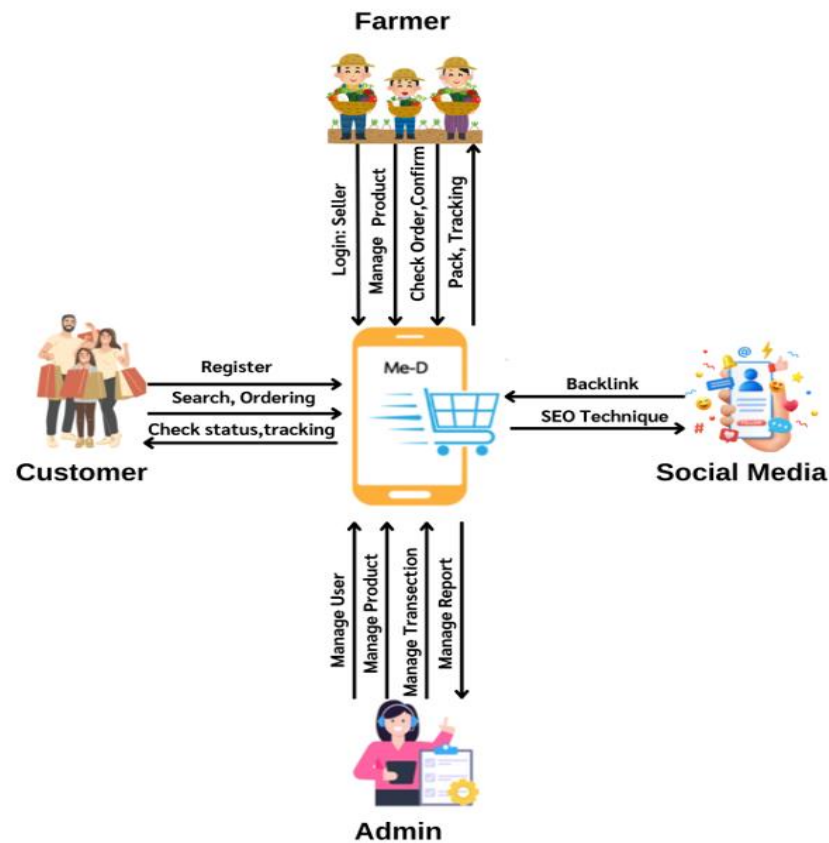
Figure 2.
Final mobile application (Me-D).

5. Conclusion

The development of the Mobile Application Framework (MAF) for community commerce demonstrates how mobile technology can empower local entrepreneurs by expanding digital market access and fostering self-sufficiency. Using the waterfall approach within the Software Development Life Cycle (SDLC), the project resulted in a mobile application that meets key usability, security, and scalability standards aligned with industry best practices [28-29].

Findings highlight the critical role of mobile applications in rural economic development, enabling community vendors to establish digital storefronts, conduct direct-to-consumer transactions, and process payments securely. By integrating perspectives from both existing models and community stakeholders, the study leveraged a mixed-methods approach to design a well-rounded MAF tailored for product vendors, mobile app developers, and end users. This methodological approach allowed for a comprehensive synthesis of data, ensuring the framework was grounded in real-world needs and insights.

A systematic and iterative implementation of the SDLC placed users at the center of development, emphasizing accessibility, security, and trust. Participants praised the MAF's cross-device compatibility, ease of use, and secure infrastructure. However, they also emphasized the need for greater flexibility and scalability in future iterations.

Beyond its technical merits, the MAF has the potential to drive self-reliance and sustainable economic growth by facilitating seamless transactions while fostering community engagement and entrepreneurial opportunities. Moving forward, continuous refinement and user testing will be essential to enhance the framework's practicality and impact. Ensuring its alignment with the evolving needs of community vendors and consumers will be key.

Ultimately, this study underscores the value of collaborative, user-centered design in developing technological solutions that promote economic self-sufficiency and community-driven growth.

6. Limitations

Despite the study's many contributions, the authors acknowledge several limitations. These include the study's limited sample size of 15 experts, requiring further validation with a more extensive user base. The application was developed specifically for Thai community commerce, meaning cross-regional applicability requires further study. The moderate rating for system flexibility suggests that future updates will be necessary to accommodate expanding user needs.

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