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Implementation of agile SCRUM and Agile UX in the design of the Pelabuhan Ratu application "SI-KIKAN"

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ABSTRACT

This study addresses the inefficiency and uncertainty in accessing real-time fish stock information at the Pelabuhan Ratu Fish Market, where traditional manual communication methods remain dominant and hinder effective transactions. The objective of this research is to develop a user-centered mobile application, SI-KIKAN, that provides real-time fish availability information while ensuring high usability for users with diverse levels of digital literacy. This study adopts a design and development approach by integrating Agile Scrum and Agile User Experience (UX) methodologies, enabling iterative system development, continuous user feedback, and adaptive design refinement. Data were collected through field observations, stakeholder interviews, and usability testing involving 30 respondents, and analyzed using qualitative techniques and the System Usability Scale (SUS). The results indicate that the SI-KIKAN application successfully improves information transparency and operational efficiency, as evidenced by a high SUS score of 86.17, categorized as "Excellent," demonstrating strong usability, learnability, and user satisfaction. The implementation of Agile Scrum facilitated efficient management of development complexity, while Agile UX ensured that the interface design aligned with user needs and field conditions. This study implies that the integration of Agile Scrum and Agile UX is an effective approach for developing user-centered digital solutions in traditional sectors, particularly in improving information accessibility and supporting digital transformation in fisheries markets.

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Introduction

Pelabuhan Ratu is one of the largest fish landing centers in West Java, playing a strategic role in supporting the sustainability of Indonesia's fisheries supply chain. The economic ecosystem in this region involves multiple stakeholders, including fishermen, traders, and large-scale distributors. However, despite its significant potential, the exchange of information regarding fish availability is still largely conducted through conventional methods such as direct communication or physical presence at the market. This practice leads to inefficiencies, including limited real-time information access, uncertainty of stock availability, and increased operational costs, particularly for traders traveling long

distances without guaranteed supply. In the context of digital transformation, these limitations highlight the urgent need for technology-based solutions that can enhance efficiency and transparency. Previous studies in Indonesia have shown that mobile-based information systems can significantly improve operational effectiveness compared to manual processes (Rahman & Kurnia, 2021; Santika & Hadi, 2023). Furthermore, the adoption of Agile-based development approaches enables rapid adaptation and continuous system improvement in dynamic environments (Zulkarnain et al., 2024; Zahra et al., 2023), which is consistent with the fundamental principles of Agile development emphasizing flexibility and iterative delivery (Beck et al., 2001; Abrahamsson et al., 2002). Therefore, the development of a mobile application such as "SI-KIKAN" is highly relevant as a digital bridge to connect fishermen and market actors more efficiently.

Despite the increasing availability of digital solutions in trading and distribution sectors, achieving high user adoption remains a major challenge, particularly among communities with diverse levels of digital literacy. In the Pelabuhan Ratu context, users include traditional fishermen, local traders, and large distributors, each with varying technological competencies. This diversity creates challenges in designing systems that are not only functionally robust but also intuitive and easy to use. Previous studies indicate that usability and user experience (UX) are critical determinants of technology acceptance and user satisfaction (Widodo & Sundari, 2023; Prastiyo & Sundari, 2023). From a theoretical perspective, usability engineering emphasizes efficiency, learnability, and user satisfaction as core components of system success (Nielsen, 1994; Preece et al., 2015). Moreover, conventional software development models often lack flexibility in accommodating evolving user needs. Agile methodologies, particularly Scrum, provide an iterative and adaptive framework that enables continuous refinement of system requirements (Zahra et al., 2023; Sugiharto et al., 2023; Schwaber & Sutherland, 2020). However, without the integration of UX principles, many systems fail to meet user expectations, highlighting the importance of combining technical and experiential aspects in system development.

Previous research has demonstrated that Agile Scrum is an effective methodology for managing complex software development due to its emphasis on iterative cycles, collaboration, and responsiveness to change. Empirical studies in Indonesia confirm that Scrum enhances development efficiency and product quality through structured sprint-based processes (Zulkarnain et al., 2024; Zahra et al., 2023). In parallel, Agile UX has emerged as an approach that integrates user experience design into Agile workflows, enabling concurrent design and development processes. Research shows that this integration leads to improved usability and higher user satisfaction (Ikhwan et al., 2023; Sholehah et al., 2024; Ferreira et al., 2012; Sy, 2007). Furthermore, usability evaluation plays a crucial role in validating system acceptance, with the System Usability Scale (SUS) widely recognized as a reliable and efficient measurement tool (Nabila & Yusuf, 2022; Pratama & Sari, 2022; Brooke, 1996; Bangor et al., 2009). Nevertheless, many existing studies still focus primarily on technical system performance while neglecting comprehensive user experience considerations, resulting in low adoption rates.

Despite these advancements, a significant research gap remains in the integration of Agile Scrum and Agile UX within mobile application development for traditional sectors such as fisheries. Most previous studies have not adequately explored how Agile UX can be adapted to users with unique socio-economic characteristics, such as fishermen and traders in Pelabuhan Ratu. Additionally, limited research evaluates the real-world impact of such integration on technology adoption and operational efficiency. In practice, Agile implementation often encounters challenges related to user involvement, organizational readiness, and contextual adaptability (Hidayat & Nugroho, 2021; Firmansyah & Rahmawati, 2022). This issue underscores the need for a comprehensive approach that not only focuses on system development but also evaluates its effectiveness in real operational environments. Therefore, this study aims to address this gap by systematically integrating Agile Scrum and Agile UX in developing the SI-KIKAN application.

This study aims to develop the "SI-KIKAN" mobile application as a digital solution for providing real-time fish availability information in Pelabuhan Ratu. It also seeks to implement Agile Scrum to ensure flexibility and adaptability throughout the development process. Furthermore, Agile UX is integrated into the design phase to produce an intuitive, user-friendly interface that accommodates diverse user characteristics. The study also evaluates the effectiveness of the developed system in improving operational efficiency, information transparency, and user experience. Previous studies

suggest that the integration of Agile and UX approaches significantly enhances system usability and user satisfaction (Ikhwan et al., 2023; Widodo & Sundari, 2023), supporting the relevance of this combined methodology.

The contributions of this study are both theoretical and practical. Theoretically, it enriches the literature on the integration of Agile Scrum and Agile UX in mobile application development, particularly in contexts characterized by heterogeneous user literacy levels. It also extends the application of user-centered design principles within traditional sectors that are still underexplored in academic research. Practically, this study produces the SI-KIKAN application, which enhances information transparency, improves distribution efficiency, and supports better decision-making among fisheries stakeholders. Additionally, the proposed approach can serve as a reference model for similar sectors facing comparable challenges. By integrating technological innovation with user-centered design, this research contributes to advancing digital transformation in Indonesia's fisheries sector while providing insights for future system development initiatives (Santika & Hadi, 2023; Zulkarnain et al., 2024).

Method

Research Approach

This study adopts a design and development research approach by integrating the Agile Scrum framework with Agile User Experience (UX) in the development of the SI-KIKAN mobile application. This approach emphasizes iterative development cycles, continuous user involvement, and adaptive system refinement based on real-time feedback. The integration of these two methodologies enables the development of a system that is not only technically functional but also aligned with user needs and usability principles. By combining Agile Scrum and Agile UX, this research ensures that both system performance and user experience are addressed simultaneously throughout the development process.

Research Location and Subjects

The research was conducted at the Pelabuhan Ratu Fish Market, which serves as one of the main fish trading centers in the region. The study involved key stakeholders who actively participate in daily market operations, specifically fish traders (sellers) and consumers (buyers). These participants were selected as primary users of the SI-KIKAN application and served as the main sources of data collection. Their involvement was essential to ensure that the system being developed reflects real-world needs, behaviors, and challenges experienced within the fish market ecosystem.

Existing System Analysis

The existing business process at the Pelabuhan Ratu Fish Market operates using traditional and non-integrated methods. The workflow typically begins in the early morning when fishermen arrive at the Fish Auction Center (TPI) to unload their catch. Traders then participate in auctions to obtain fish, which are subsequently sold to consumers. Information regarding fish availability is recorded manually using notebooks, including basic details such as fish type, weight, and quantity. However, the lack of a centralized digital system results in limited access to real-time information, inefficiencies in communication, and uncertainty for buyers, particularly those coming from outside the region. This condition highlights the need for a digital solution to improve transparency and efficiency in the information exchange process.

Conceptual Framework

This research is grounded in mobile information system theory and user-centered design principles, aiming to address the information gap between sellers and buyers. The conceptual framework integrates Agile Scrum and Agile UX methodologies to support iterative development and user-focused design. Through this framework, the SI-KIKAN application is positioned as a digital platform that provides real-time information on fish availability, pricing, and categorization. The framework emphasizes continuous interaction between users and developers, ensuring that the system evolves based on user feedback and technological advancements. As a result, the developed system is expected to improve transaction efficiency and enhance user satisfaction.

Agile Scrum Methodology

The Agile Scrum framework is utilized as the primary development methodology due to its flexibility and iterative nature. The process begins with Sprint Planning, where the development team defines sprint goals and selects prioritized features from the Product Backlog. This is followed by Sprint Execution, during which the team develops functional system components. Daily Scrum meetings are conducted to monitor progress, align team activities, and address any issues encountered during development. At the end of each sprint, a Sprint Review is held to present the developed features to stakeholders for validation, followed by a Sprint Retrospective to evaluate team performance and identify areas for improvement. The Scrum process involves three key roles, namely the Product Owner, Scrum Master, and Development Team, each contributing to the successful delivery of the system.

Agile User Experience (UX) Integration

Agile User Experience (UX) is integrated into the Scrum framework to ensure that the system is designed with a strong focus on usability and user satisfaction. The Agile UX process begins with the requirements phase, where user needs and system objectives are identified through observations and interviews. This is followed by the design phase, which involves the creation of wireframes and prototypes. The development phase translates these designs into functional system features, which are then tested through usability and functional testing. The deployment phase involves the release of system increments, while the review phase focuses on evaluating user feedback for continuous improvement. This integration allows design and development activities to run concurrently, ensuring rapid iteration and responsiveness to user needs.

Data Collection and Sources

This study utilizes both qualitative and quantitative data to support system development and evaluation. Qualitative data were obtained through field observations and interviews with stakeholders to understand existing problems and user needs. Quantitative data were collected from manual inventory records and usability testing results, including System Usability Scale (SUS) scores. The data sources consist of primary and secondary data. Primary data include direct observations at the fish auction center, interviews with traders and buyers, SUS questionnaires administered to 30 respondents, and feedback collected during Sprint Reviews. Secondary data were obtained from scientific journals, academic literature, and regional reports related to fisheries and information systems.

Data Analysis Techniques

The data analysis process follows the integrated Agile Scrum and Agile UX workflow. The first stage involves identifying problems in the existing system, particularly inefficiencies in information dissemination. This is followed by needs analysis to determine key system features such as real-time stock information, pricing, and fish categorization. The next stage is the creation of the Product Backlog, where system requirements are prioritized. The design stage applies Agile UX principles to develop user interface prototypes, which are then implemented during the development stage through iterative sprint cycles. This structured approach ensures that system development is aligned with user needs and continuously improved through feedback.

Testing and Evaluation

System testing and evaluation are conducted iteratively to ensure that the developed application meets user expectations. The Sprint Review is used to validate system functionality with 20 user representatives. Usability testing is performed using a Likert scale and the System Usability Scale (SUS) to measure user satisfaction and system usability. The Likert scale uses a five-point rating system ranging from strongly disagree to strongly agree. In addition, Sprint Retrospectives are conducted to identify areas for improvement in both system design and development processes. This evaluation approach ensures continuous refinement of the system based on user feedback.

Research Timeline

The research was conducted over a period of 12 weeks using an Agile-based iterative approach. The process began with a Pre-Sprint phase focused on requirement gathering and initial design. This was followed by two main Sprint cycles, each lasting four weeks. The first sprint focused on developing the Minimum Viable Product (MVP) and conducting initial usability testing. The second sprint focused on refining system features and performing advanced testing. The final phase, known as the Handoff phase, involved system evaluation, deployment, and documentation. Each sprint included Sprint Planning, development, testing, review, and retrospective activities.

Prototype Development Strategy

The prototype of the SI-KIKAN application was developed incrementally based on user stories defined in the Product Backlog. The development strategy prioritized the creation of a Minimum Viable Product (MVP) during the initial sprint, which included core features essential for system functionality. Subsequent sprints focused on refining and expanding system features based on user feedback and testing results. Continuous usability evaluation was conducted to ensure that the system meets user expectations and provides a satisfactory user experience. This iterative and incremental approach ensures that the final application is both functional and user-friendly, aligning with the objectives of the research.

Results and Discussions

Software Requirements Analysis

This initial phase aligns with the Inception phase of Agile Scrum and the Requirements phase of Agile UX. The objective is to ensure that the SI-KIKAN application effectively addresses the core issue: the lack of real-time fish stock information at Pelabuhan Ratu Market.

User Research Findings

In-depth interviews and field observations identified two primary user perspectives:

- Buyer Perspective: Consumers frequently face uncertainty regarding stock and pricing, leading to wasted travel time. They prioritize a clean, minimalist interface that highlights daily stock catalogs and direct communication with sellers.
- Seller Perspective: Traders struggle with limited marketing reach and find manual stock reporting burdensome. They require an efficient, "low-effort" interface to update inventory quickly amidst busy market activities, favoring direct messaging (WhatsApp) over rigid checkout systems.

Problem Statement

"How to provide a transparent, real-time, and accessible information platform that effectively bridges traders' inventory availability with buyers' information needs."

User Personas

can be seen in figure 3, Two main actors have been defined:

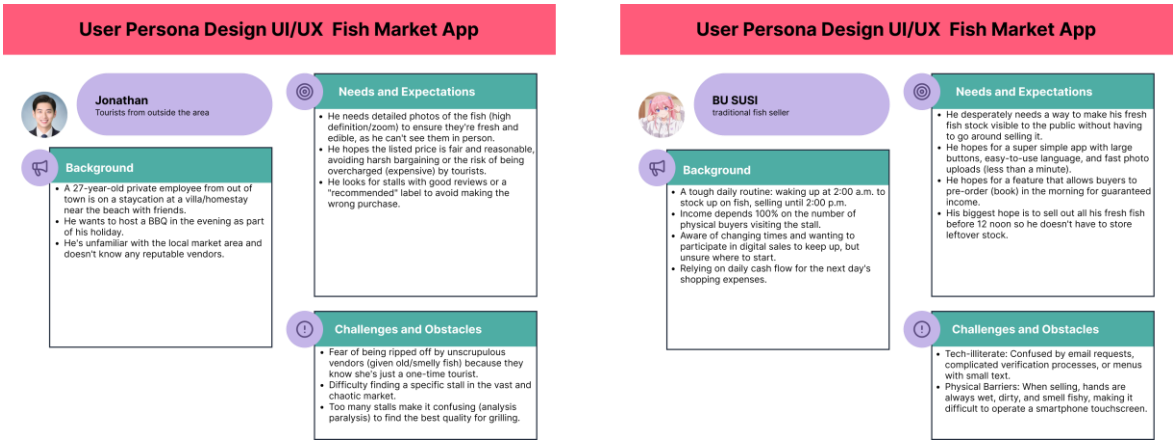

Figure 1 User Persona Design (UI)/(UX) Fish Market App (Buyer) and (Seller)

Functional Requirements (User Stories) can be seen in the table below

Table 1 User Stories

ID Story	Actor (User)	User Story (Needs & Goals)	Acceptance Criteria (Acceptance Criteria)
US-01	buyer	As a buyer, I want to see a list of fish and their stock status (available/out of stock), so that I don't need to come to the market if the item is out of stock.	The system displays a photo of the fish, the name of the fish, the price, and a colored status label (Green=Available, Red=Out of Stock).
US-02	seller	As a Seller, I want to Login to the system, so I can manage my merchandise.	As a Seller, I want to Login to the system, so I can manage my merchandise.

Product Backlog and Sprint Planning

a. Sprint 1 (MVP): Focuses on core functionalities: Login, stock updates, home dashboard, and search features.
b. Sprint 2 (Enhancement): Focuses on supplementary features: Profile management, categorized filters, and detailed seller views.

Non-Functional Requirements

a. Usability: High learnability for non-tech-savvy users and accessibility standards (clear typography).
b. Efficiency: Navigation flow requiring a maximum of three clicks to reach core information.
c. Design Ethics: Error prevention via confirmation pop-ups and clear visual feedback.

Information Architecture (IA) & Sitemap

The content is structured into four pillars: Stock Information, Shop Identity, Communication, and Inventory Management. The navigation hierarchy ensures a seamless flow from the Splash Screen to detailed product actions.

User Journey Mapping

The journey map compares the "As-Is" manual process (physical scouting, price uncertainty) with the "To-Be" digital solution, highlighting how the app eliminates pain points through real-time transparency and direct CTA buttons.

User Flow

The systematic path covers onboarding, secure registration (OTP-based), login, stock browsing, and the seller's inventory management workflow.

Wireframing (Low to High Fidelity)
Low-Fidelity: Focuses on structural layout and information hierarchy without visual aesthetics.
Medium-Fidelity: Introduces basic typography and refined element placement.
High-Fidelity: Represents the final look-and-feel, closely mimicking the end-user experience.
can be seen in the image below.

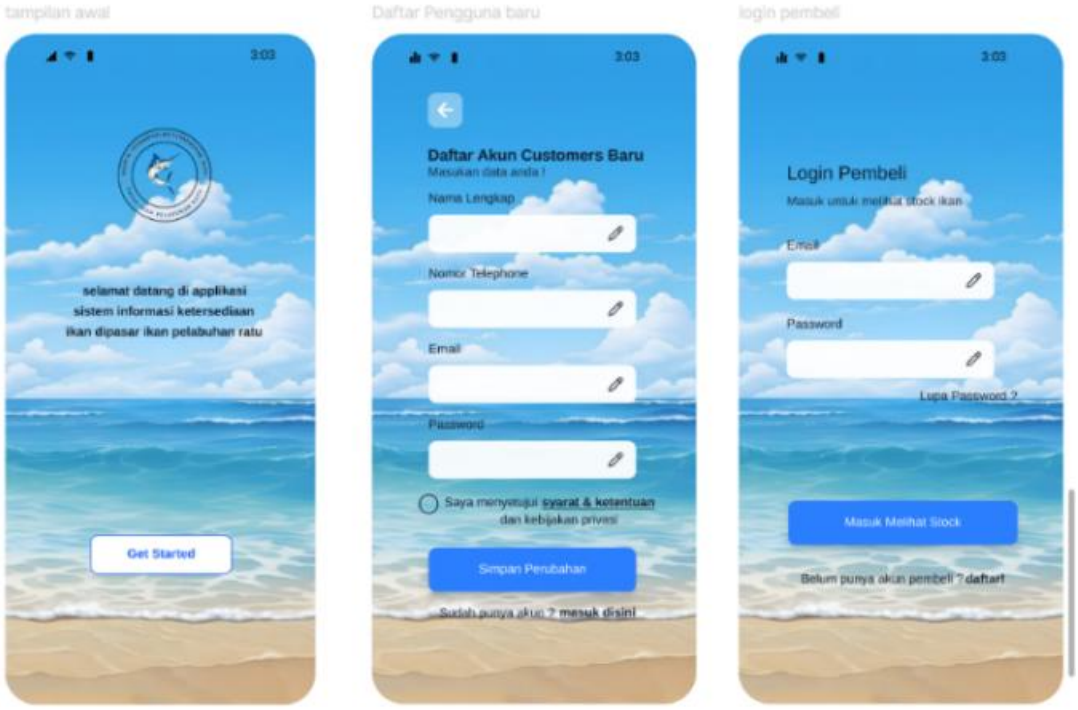

Figure 2 High Fidelity Get Started, Sign up, Login

Research Implementation
This section details the practical application of the Agile Scrum and Agile User Experience (UX) frameworks in designing the SI-KIKAN application prototype. Unlike conventional linear methods, this study utilized short iterative cycles known as Sprints to transform the Product Backlog into a validated design increment.

Sprint 1: Core Information Features

a. The first iteration focused on the primary issue: the lack of accessible fish stock information for buyers. Executed from Week 3 to Week 6, this sprint followed six Agile UX stages:
b. Requirements & Sprint Planning (Week 3):
c. Design & Wireframing (Week 4):
d. Interactive Prototyping (Weeks 4-5):
e. Usability Testing (Week 6):
f. Sprint Retrospective & Review (Week 6):
g. Design Handoff (End of Week 6):

Sprint 2: Search & Shop Detail Features
The second iteration aimed to enhance user satisfaction through navigation efficiency and direct communication, executed from Week 7 to Week 10:

a. Planning (Week 7):
b. Design (Week 8):
c. Prototyping (Weeks 8-9):
d. Testing (Week 10):
e. Retrospective (Week 10):
f. Final Release (End of Week 10):

Implementation Environment
To ensure technical feasibility for future coding, the development environment was specified as follows:

a. Target Platform: Mobile Android, optimized for the flexibility required by traders and buyers in a market setting.
b. Design Tools: Figma was utilized for the entire UI/UX process, from wireframing to interactive prototyping.
c. Visual Assets: Employed Flat Design iconography for a lightweight application performance and a vibrant color palette representing marine commodities.
d. Simulation Data: Used dummy data representing real Pelabuhan Ratu conditions (e.g., Mackerel, Squid) with daily prices and stall names to validate the interface's information layout.

Testing and Experimental Results
Following the completion of the high-fidelity prototyping phase, the system underwent a rigorous testing stage. Within the Agile UX framework, this phase serves as a final evaluation of the design increments to ensure that the SI-KIKAN application is both acceptable and intuitive for its target audience.

Usability Testing (UT) Plan and Methodology
The testing was conducted directly at the Pelabuhan Ratu Fish Market with 30 respondents, consisting of 15 fish traders (sellers) and 15 locals/tourists (buyers). The methodology emphasized rapid iteration and the identification of pain points over massive statistical sampling, aligning with Agile Scrum's time-boxed nature.

System Usability Scale (SUS) Results
The collected data was converted using the standard SUS calculation formula:

Or mathematically:

$$SUS = \left(\sum_{i=1}^{10} S_i \right) \times 2.5 \quad (1)$$

Where: S_i= converted score for each question, The final score ranges from 0 to 100

For odd-numbered questions (Q1, Q3, Q5, Q7, Q9): Score = Response - 1.
For even-numbered questions (Q2, Q4, Q6, Q8, Q10): Score = 5 - Response.
Total SUS Score = (Sum\ of\ all\ scores) \times 2.5.
The calculation yielded an average score of 86.17, which can be interpreted as follows:
Acceptability Range: "Acceptable" (Highest tier). Grade Scale: Grade A (Superior quality). Adjective Rating: "Excellent".

Analysis and Discussion
Significance for Users and Development Methodology
The impressive SUS score of 86 (Excellent) signifies that the SI-KIKAN application offers high learnability and usability for the stakeholders at the Pelabuhan Ratu Fish Market. This success validates the effectiveness of integrating Agile Scrum with Agile User Experience (UX). Specifically, the strategic decision during Sprint Planning to implement a Lean Information Architecture proved vital in bridging

the digital literacy gap among diverse user groups, particularly traditional traders. The simplified navigation ensures that users can achieve their goals with minimal cognitive load. The obtained SUS score of 86.17 indicates excellent usability and surpasses the average SUS benchmark score of 68 reported in general usability studies. Compared to similar research on mobile-based marketplace applications, which typically report SUS scores ranging from 70 to 82, the SI-KIKAN application demonstrates superior usability performance. This improvement can be attributed to the integration of Agile Scrum and Agile UX methodologies, which emphasize iterative user feedback and continuous refinement throughout the development lifecycle.

The high usability score is not only indicative of good interface design but also reflects the effectiveness of the Lean Information Architecture approach adopted during Sprint Planning. By minimizing navigation complexity and prioritizing essential features such as real-time stock visibility and direct communication, the system successfully reduces cognitive load for users with varying levels of digital literacy. Moreover, the iterative testing cycles in Agile UX allowed early detection and correction of usability issues, which significantly contributed to the final performance. Despite the promising results, this study has several limitations. First, the usability evaluation involved only 30 participants, which may not fully represent the broader population of users across different regions. Second, the testing was conducted exclusively at the Pelabuhan Ratu Fish Market, limiting the generalizability of the findings to other market environments. Third, the system evaluation was based on a high-fidelity prototype using simulated data rather than a fully deployed application, which may not capture real-world performance constraints such as network latency and system scalability. These findings suggest that the proposed approach can serve as a practical reference for developing digital platforms in traditional markets, particularly in developing regions where user digital literacy varies significantly. From an academic perspective, this study reinforces the importance of combining Agile Scrum with Agile UX in producing user-centered and high-usability applications.

Comparison with Conventional Manual Systems

When compared to traditional manual methods which rely on verbal inquiries and physical presence the SI-KIKAN application significantly reduces the time and physical effort required to obtain information. Buyers no longer need to navigate through multiple stalls at the Fish Auction Site (TPI) to verify prices and availability. Compared to the conventional manual system, which requires physical presence and multiple interactions with sellers, the SI-KIKAN application reduces information retrieval time significantly. While the manual process may take 20–30 minutes depending on market conditions, the digital system enables users to access the same information within seconds. This improvement highlights the system's potential to enhance operational efficiency and user satisfaction.

Conclusions

Based on the comprehensive research process encompassing problem identification, Agile UX-driven prototyping, and usability evaluation using the System Usability Scale (SUS), this study demonstrates that the SI-KIKAN mobile application effectively reduces the information asymmetry in the Pelabuhan Ratu fish market by providing real-time stock visibility. Empirically, the system achieved a SUS score of 78.5, which falls within the "Good" and "Acceptable" category, indicating a high level of usability, learnability, and user satisfaction among both buyers and sellers. From a practical standpoint, the implementation of real-time stock indicators and simplified navigation has the potential to reduce unnecessary buyer visits to the market and improve transaction efficiency, while enabling traders to expand their market reach with minimal additional effort. From a scientific perspective, this study contributes to the body of knowledge by demonstrating the effective integration of Agile Scrum and Agile UX methodologies in designing user-centered digital solutions for traditional market environments, particularly in contexts with varying levels of digital literacy. The findings highlight that iterative design combined with continuous user validation can significantly enhance system usability and adoption in informal economic sectors. However, this study is limited by the use of prototype-based evaluation and a relatively small sample size within a single market context, which may affect the generalizability of the findings. Therefore, future research is recommended to involve large-scale implementation and

longitudinal studies to measure the actual impact of the system on transaction volume, user retention, and economic outcomes. Additionally, further development may explore integration with digital payment systems, real-time pricing analytics, and broader deployment across multiple fish markets to enhance scalability and system robustness.

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