PILAR Nusa Mandiri: Journal of Computing and Information System
Vol. 21, No. 2 September 2025 | DOI: 10.33480/pilar.v21i2.6456

KOPTIHUB: A WAREHOUSE APPLICATION PROTOTYPE FROM COOPERATIVE PERS PECTIVE

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Abstract—*Effective warehouse management is crucial for ensuring the availability of raw materials and smooth product distribution, particularly at Sentra Industri Kecil Somber (SIKS) Balikpapan, which specializes in soybean-based industries. Manual record-keeping has presented significant challenges, leading to recording errors, stock discrepancies, and delays in raw material procurement. To address these issues, a digital warehouse management prototype, "KoptiHub," was developed using a User-Centered Design (UCD) approach. This approach aimed to enhance inventory tracking efficiency, streamline raw material ordering, and improve overall product distribution. The prototype was evaluated using the System Usability Scale (SUS) with 15 cooperative administrators at SIKS Balikpapan. The evaluation yielded an SUS score of 82.17, resulting in an "A" grade, which indicates high usability and strong alignment with user expectations. Compared to previous warehouse management solutions, KoptiHub demonstrates superior usability, particularly in cooperative settings. However, further improvements, such as a simplified user interface and an AI-driven inventory forecasting feature, could enhance efficiency and accessibility. The results suggest that KoptiHub could serve as a scalable model for digitizing warehouse management in MSMEs and cooperatives, aligning with emerging trends in smart inventory management and supply chain optimization.*

Keywords: *cooperative, prototype, system usability scale, user centered design, warehouse management.*

Abstrak—*Efektivitas manajemen pergudangan berperan penting dalam menjaga ketersediaan bahan baku dan kelancaran distribusi produk, terutama di Sentra Industri Kecil Somber (SIKS) Balikpapan yang bergerak di industri berbasis kedelai. Sistem pencatatan manual masih menjadi kendala utama yang menyebabkan kesalahan pencatatan, ketidaksesuaian stok, dan keterlambatan pemesanan bahan baku. Untuk mengatasi masalah ini, dikembangkan prototipe aplikasi pergudangan berbasis digital, KoptiHub, dengan pendekatan User-Centered Design (UCD) guna meningkatkan efisiensi pelacakan inventaris, pemesanan bahan baku, dan distribusi produk. Evaluasi dilakukan menggunakan System Usability Scale (SUS) dengan partisipasi 15 administrator koperasi di SIKS Balikpapan. Hasil evaluasi menunjukkan skor SUS sebesar 82,17, yang dikategorikan dalam tingkat kegunaan tinggi (A). Dibandingkan dengan solusi manajemen gudang sebelumnya, KoptiHub menunjukkan tingkat kegunaan yang lebih unggul, khususnya dalam konteks koperasi. Namun, pengembangan lebih lanjut, seperti penyederhanaan antarmuka pengguna serta integrasi fitur peramalan inventaris berbasis kecerdasan buatan (AI), berpotensi meningkatkan efisiensi dan aksesibilitas sistem. Hasil penelitian ini menunjukkan bahwa KoptiHub dapat menjadi model yang skalabel untuk digitalisasi manajemen gudang pada sektor UMKM dan koperasi, sejalan dengan tren terkini dalam manajemen inventaris cerdas dan optimalisasi rantai pasok.*

Kata Kunci*: koperasi, prototipe, skala kegunaan sistem, user centered design, manajemen pergudangan.*

INTRODUCTION

Warehouse management is a fundamental component of supply chain operations, playing a critical role in ensuring the optimal balance of supply to meet consumer demand efficiently. Effective inventory control prevents shortages and overstock, ultimately minimizing storage costs and improving operational efficiency (Shivam, & Gupta, M, 2024; Alamsah et al., 2024) . In industries that

deal with perishable goods and fluctuating demand, robust warehouse management becomes even more crucial (Wardah et al., 2023) or small and medium-sized enterprises (SMEs) and cooperatives, adopting a streamlined warehouse system can significantly impact organizational sustainability and market competitiveness (Maheshwari et al., 2021).

Sentra Industri Kecil Somber (SIKS) in Balikpapan City, East Kalimantan, is a small industrial center specializing in the production and distribution of soy-based products, particularly tofu and tempeh. It operates under PRIMKOPTI, a cooperative responsible for soybean procurement and distribution among its members, who are primarily small entrepreneurs (Gudiato et al., 2022). However, the warehouse management practices at SIKS remain largely manual, resulting in errors in inventory records, stock mismatches, and delays in raw material procurement (Gudiato et al., 2022). The absence of an integrated system has led to operational inefficiencies, increased storage costs, and delays in product distribution (Wardhani et al., 2021).

Previous studies have examined warehouse management in cooperatives, highlighting the challenges of inventory control and the impact of fluctuating raw material prices (Xyalam et al., 2023). However, research on digital solutions specifically tailored for cooperative warehouse management remains limited. Existing studies primarily focus on large-scale supply chains or generic inventory management systems, which may not fully address the unique structural and financial constraints faced by cooperatives. Moreover, limited research has explored the usability of digital warehouse applications in cooperative settings, particularly in MSME-driven industries like SIKS.

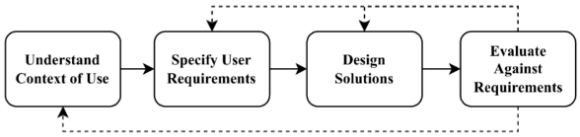
This study aims to address these gaps by developing and evaluating KoptiHub, a procurement board-based warehouse application prototype designed to provide an integrated digital system for cooperative inventory management.

With advancements in Information and Communication Technology (ICT), digital tools have the potential to optimize warehouse operations by improving inventory tracking, streamlining raw material procurement, and enhancing distribution efficiency (Wahyuni Arsyad et al., 2022). By integrating ICT solutions like KoptiHub, cooperative warehouse management can transition from manual to digital processes, fostering a smarter and more adaptive economic system. Additionally, fluctuations in soybean prices pose another critical challenge for cooperatives, affecting supply chain stability and member satisfaction (Mello et al., 2024). Research indicates that volatile raw material prices—especially for imported soybeans—can disrupt operational planning and threaten the sustainability of small-scale industries (Xyalam et al., 2023).

To address these challenges, this study develops KoptiHub, a prototype warehouse management application tailored for cooperative procurement boards. This research aims to evaluate its usability through the System Usability Scale (SUS), ensuring that the proposed system effectively enhances inventory management and operational efficiency. The contribution of this study lies in presenting a novel digital warehouse management framework for cooperatives, filling the research gap on ICT adoption in cooperative supply chains. The findings are expected to support the digital transformation of warehouse management in MSMEs, offering a scalable and efficient model that enhances cooperative sustainability amid market fluctuations.

MATERIALS AND METHODS

The prototype was designed using a User-Centered Design (UCD) approach, a cyclical methodology that prioritizes users and their requirements at every stage of the design process (Zahra & Suryatiningsih, 2024). This approach emphasizes iterative refinement based on direct user input to ensure practical and accessible final products. The UCD process typically consists of four main stages (Yudaputra et al., 2024):



Source: (Yudaputra et al., 2024)

Figure 1. User Centered Design Method

Understand context of use

This stage focuses on understanding the situation, needs, and characteristics of the users. Additionally, it identifies primary users, their goals, and how they will interact with the KoptiHub prototype (Firdaus et al., 2024). Our research methods at this stage included interviews, observations, and surveys with members of the SIKS Balikpapan Cooperative, ensuring that the design aligns with user needs and limitations.

Specify user requirements

This stage aims to determine specific user needs, encompassing necessary features, functions, and interface design elements (Aulia Putri Fajar et al., 2024). Data collected from surveys and user feedback was documented and structured as design guidelines for the KoptiHub prototype. These

PILAR Nusa Mandiri: Journal of Computing and Information System
Vol. 21, No. 2 September 2025 | DOI: 10.33480/pilar.v21i2.6456

documented requirements served as a reference throughout the iterative design process to ensure alignment with user expectations.

Designs solutions

This stage includes prototyping, from initial designs to more interactive prototypes. Based on the specified requirements, design solutions are created to address the challenges faced by users. The solution design focused on ease of use, efficiency, and accessibility for users (Halusa et al., 2024). The system was designed using Figma, an advanced prototyping tool that facilitates interactive design, real-time collaboration, and user feedback integration. Figma was selected due to its efficiency in creating and refining UI/UX components, ensuring that the system remains user-friendly and accessible to cooperative administrators.

Evaluate against requirements

The prototype was evaluated to determine whether it met user needs and expectations (Asri, Wijoyo, & Suprapto, 2022). The usability of KoptiHub was assessed using the System Usability Scale (SUS), a standardized method for evaluating system effectiveness and user satisfaction (Afrilia, 2024). The evaluation involved 15 cooperative administrators, representing 100% of the total cooperative management team. Prior research has demonstrated that 10–15 respondents are sufficient for usability testing, capturing 85-90% of usability issues (Lewis & Sauro, 2021). Participants rated 10 standardized usability statements listed in Table 1, using a 5-point Likert scale (ranging from 1 = "Strongly Disagree" to 5 = "Strongly Agree") (Huda et al., 2023).

Table 1. SUS Statements

No	Statement
1	I think I will use KoptiHub again
2	I feel KoptiHub complicated to use
3	I feel KoptiHub easy to use
4	I need help from other people or technicians in using KoptiHub
5	I feel the features of KoptiHub work properly
6	I feel that there are many things that are inconsistent (mismatched in KoptiHub)
7	I feel that others will understand how to use KoptiHub quickly
8	I feel KoptiHub is confusing
9	I feel there are no barriers in using KoptiHub
10	I need to familiarise myself before using KoptiHub

Source: (Huda et al., 2023)

To answer the statement, members of SIKS Balikpapan Cooperative are given answer choices along with predetermined scores, as listed in Table 2 (Huda et al., 2023).

Table 2. SUS Answer Options

Answer	Score
Strongly Disagree	1
Disagree	2
Neutral	3
Agree	4
Strongly Agree	5

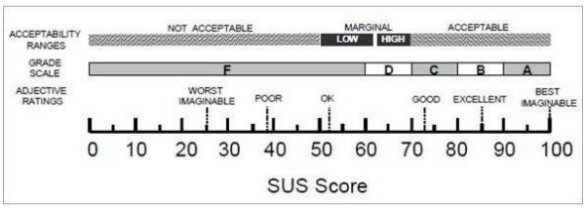
Source: (Huda et al., 2023)

The SUS scoring system accounts for both positive and negative statements to mitigate response bias (Bangor et al., 2008). For positive statements (items 1, 3, 5, 7, and 9), scores were calculated using the formula: Scale Position - 1. For negative statements (items 2, 4, 6, 8, and 10), scores were calculated using: 5 - Scale Position. Each response contributes 0 to 4 points, with a total possible score of 100 after multiplying by 2.5 for ease of interpretation (Hägglund & Scandurra, 2021). If a respondent skipped a question, the missing answer was substituted with a neutral rating (3) to maintain consistency.

The formulas used to calculate the SUS score are presented below.

SUS Score = ((Q1-1) + (Q3-1) + (Q5-1) + (Q7-1) + (Q9-1) + (5-Q2) + (5-Q4) + (5-Q6) + (5-Q8) + (5-Q10)) * 2, 5 ..... (1)

The System Usability Scale (SUS) employs a tiered scoring system, as depicted in Figure 2, to effectively interpret usability test outcomes. The System Usability Scale (SUS) categorizes usability into three levels: Not Acceptable, Marginal (Low/High), and Acceptable, based on user feedback. Furthermore, the SUS score is mapped onto a traditional grading scale, with scores below 50 receiving an "F" and scores above 70 corresponding to grades ranging from "C" to "A." To enhance usability analysis, qualitative descriptors were also applied, categorizing scores into "Worst Imaginable" (0–25), "Poor" (26–39), "OK" (40–59), "Good" (60–69), "Excellent" (70–84), and "Best Imaginable" (85–100) (Deshmukh & Chalmeta, 2024). This multi-faceted scoring framework provides a clear and structured approach to evaluating system usability, enabling developers to pinpoint areas for improvement and make informed decisions to enhance the user experience.

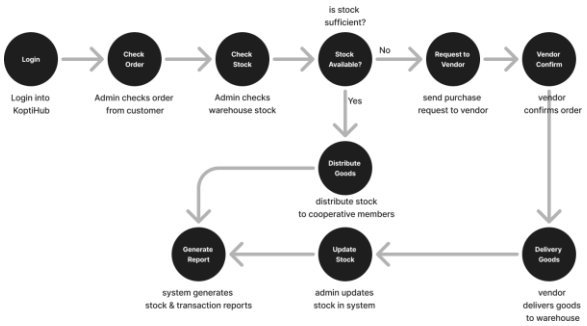


Source: (Cheah et al., 2023)

Figure 2. SUS Scoring Framework

Workflow of KoptiHub

To provide a clearer understanding of how KoptiHub functions, Figure 3 presents its workflow diagram, illustrating the key processes from user interaction to system feedback.



Source: (Research Result, 2025)

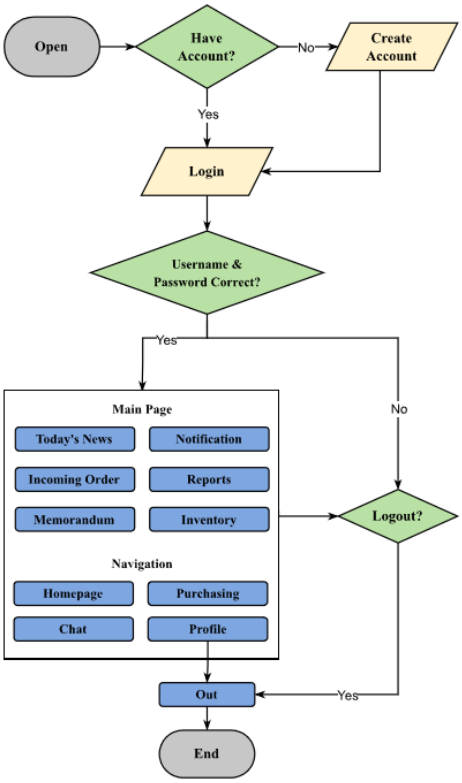
Figure 3. KoptiHub Workflow Diagram

RESULTS AND DISCUSSION

Use of Applications

Based on interviews with the management of SIKS Balikpapan cooperative, they need a system that can provide real-time inventory tracking and reporting. Such a system would also facilitate efficient procurement of raw materials from suppliers, while offering a user-friendly interface.

User Requirements

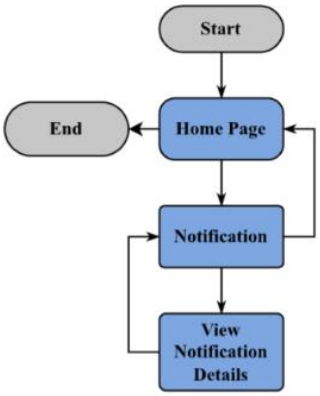


Source: (Research Result, 2025)

Figure 4. Main Flow

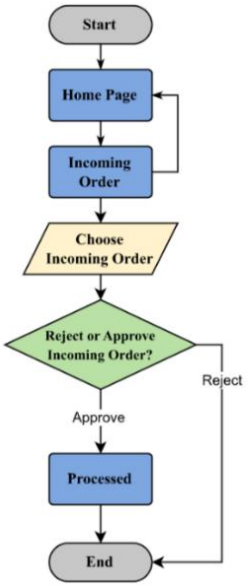
According to the flowchart in Figure 4, users of KoptiHub must begin by opening the application and initiating the login process. Upon successfully entering valid credentials, users will be directed to the main page. On this main page, users can access various features, including viewing the latest news, managing incoming orders, checking reports, monitoring inventory, making purchases, managing personal profiles, and interacting with other users through the chat feature.

When users select the "Notification" option from the main menu, they are immediately directed to a detailed notification view. This view displays comprehensive information about the selected notification, including the message content, timestamp, and potential actions the user can take. Upon completing the notification review, the user typically returns to the main menu to resume other activities. The specifics of this flow are illustrated in Figure 5.



Source: (Research Result, 2025)

Figure 5. Notifications Flow



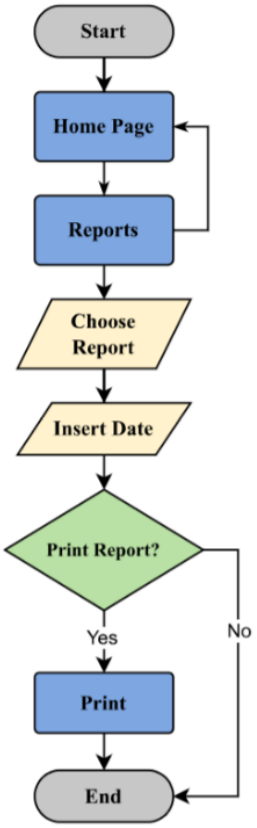
Source: (Research Result, 2025)

Figure 6. Incoming Order Flow

PILAR Nusa Mandiri: Journal of Computing and Information System
Vol. 21, No. 2 September 2025 | DOI: 10.33480/pilar.v21i2.6456

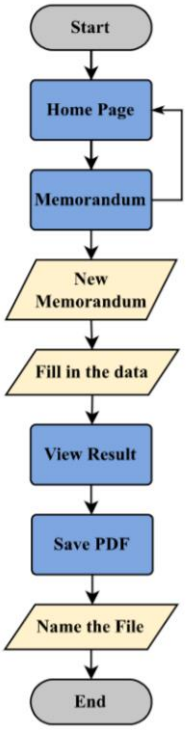
Figure 6 illustrates the flow when a user selects the "Incoming Orders" feature from the main menu. The user can choose a specific order to process, after which the system presents two options: approve or reject the order. If approved, the order is marked as "Processed" and moves to the next stage in the business process. Otherwise, if rejected, the order is returned to its previous status and no further action is taken.

When the user selects the "Reports" option from the main menu, they can choose the specific report type they want to print and input the desired date for the report. The system then provides an option to print the report. If the user chooses to print, the system will initiate the printing process. Otherwise, the process will end. The specifics of this flow are illustrated in Figure 7.



Source: (Research Result, 2025)
Figure 7. Reports Flow

When they select the "Memorandum" option from the main menu, they are prompted to create a new memorandum. The user then fills in the required data fields. Once the data has been entered, the user can review the input. If satisfied, the user can save the memorandum as a PDF and assign a file name. The specifics of this flow are illustrated in Figure 8.



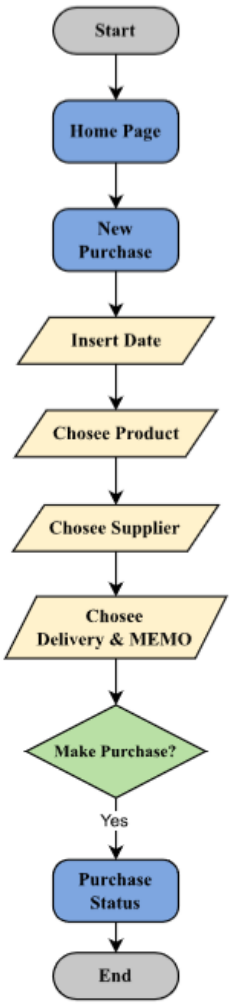
Source: (Research Result, 2025)
Figure 8. Memorandum Flow

When a user selects the "Inventory" option from the main menu, the system will immediately provide an option to print an inventory report. If the user selects "Yes," the system will initiate the printing process. Otherwise, the process will end. The specifics of this flow are illustrated in Figure 9.

Source: (Research Result, 2025)
Figure 9. Inventory Flow

When the user selects the "New Purchase" option from the purchase page, they will be directed to enter the transaction date. Once the date is recorded, the user selects the desired product. After selecting the product, the system will display a list

of suppliers providing that product. The user will then select the desired supplier. Next, the user will specify the delivery details and may add a memo or special note regarding the purchase. Once all of the above details have been determined, the system will display a confirmation question, "Make a Purchase?" If the user confirms by selecting "Yes", the purchase transaction will be processed and the purchase status will be displayed. The purchase process is then complete. The specifics of this flow are illustrated in Figure 10 below.

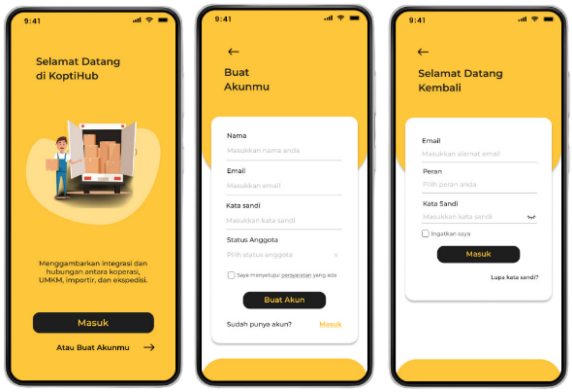


Source: (Research Result, 2025)
Figure 10. Purchase Flow

Prototype Design Solutions

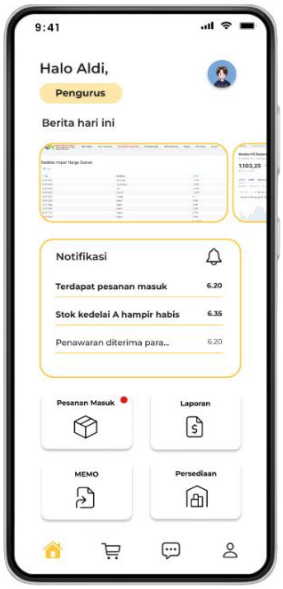
The following is a prototype design for each feature that has been adjusted to the previously described user flow.

On the login page, user will be prompted to enter their email, role, and password to access the KoptiHub application. If a user does not have an account, they can select the “Create your account” option. Refer to Figure 11 for the prototype design.



Source: (Research Result, 2025)
Figure 11. Login Page

The homepage offers users a quick overview of today’s news, notifications, and four features such as incoming orders, reports, memorandum, and inventory. The navigation menu also includes pages for purchases, messages, and profile. Refer to Figure 12 for the prototype design.



Source: (Research Result, 2025)
Figure 12. Home Page

When selecting the “Incoming Order” feature, user can view both unprocessed and processed orders. User can approve or reject incoming orders. Orders that comply with the regulations will be marked with a green circle and automatically moved to the “Processed” page upon approval. Orders that do not comply will be marked with a red circle and user will be required to provide a reason for rejection. Rejected orders will be automatically deleted. Refer to Figure 13 and Figure 14 for the prototype design.

PILAR Nusa Mandiri: Journal of Computing and Information System
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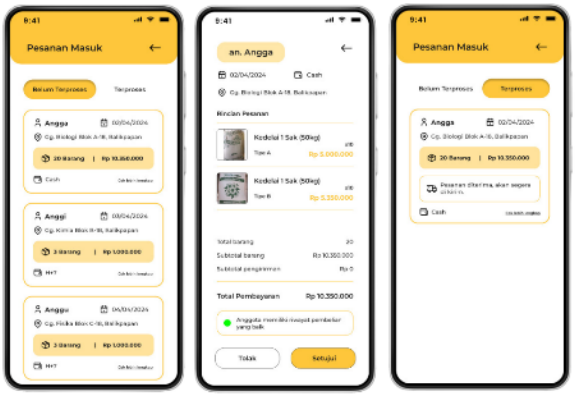
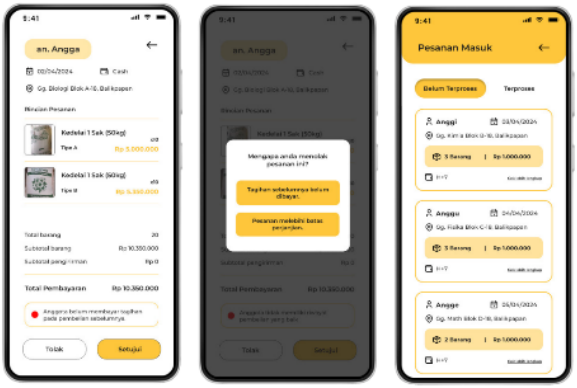
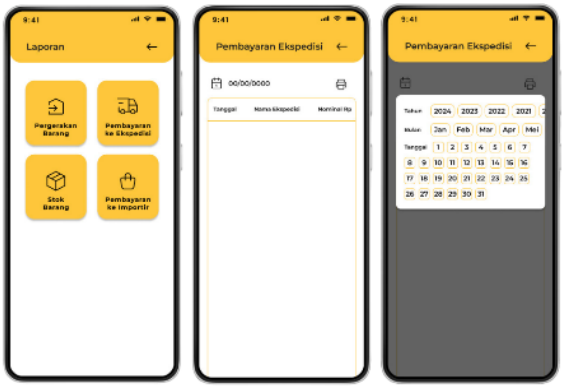


Source: (Research Result, 2025)
Figure 13. Accepted Incoming Order

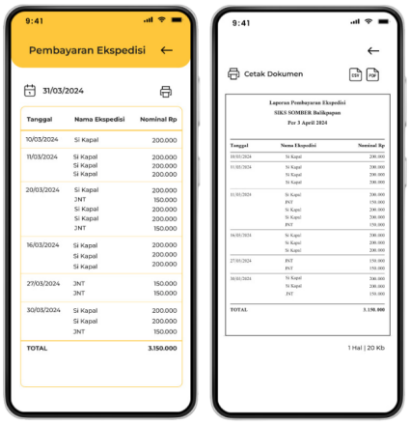


Source: (Research Result, 2025)
Figure 14. Rejected Incoming Order

When selecting "Reports" feature, user will be prompted to choose a report type, such as inventory movement, shipping payments, stock levels, or importer payments. After selecting a report type, user will be required to input a date range for the desired report. User can either view the report on the screen or download it in PDF of CSV format. Refer to Figure 15 and Figure 16 for the prototype design.

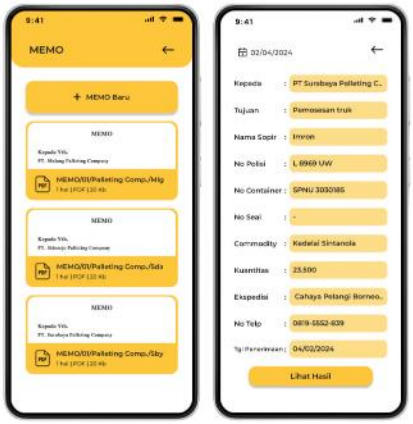


Source: (Research Result, 2025)
Figure 15. Reports Page

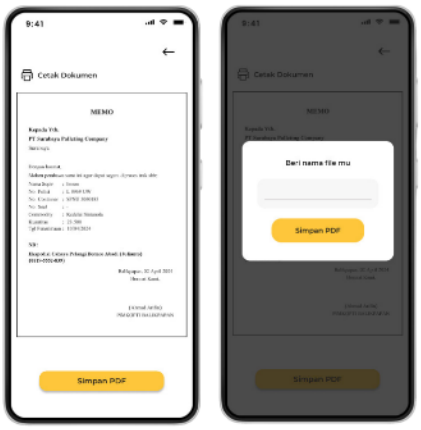


Source: (Research Result, 2025)
Figure 16. Print Report

The "MEMO" feature allows to view previously created memos and create new ones by clicking the "New MEMO" button. When creating a new memo, user will be prompted to fill in the required information. Once the data has been input, user can preview the memo and assign a file name before saving the file. Refer to Figure 17 and 18 for the prototype design.

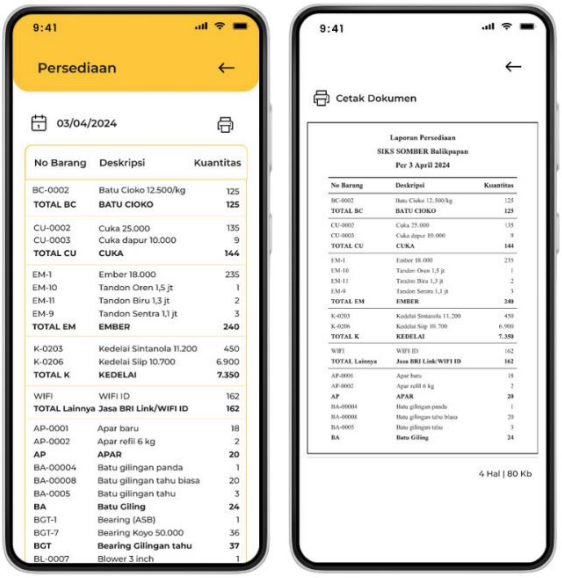


Source: (Research Result, 2025)
Figure 17. Create Memorandum



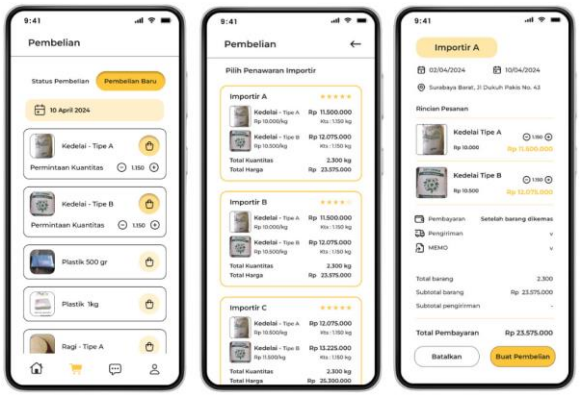
Source: (Research Result, 2025)
Figure 18. View and Save Memorandum

When user select the "Inventory" feature, they will immediately see a list of the current inventory as of that day. A "Print" button located in the upper right corner allows user to generate a printed report. Refer to Figure 19 for the prototype design.

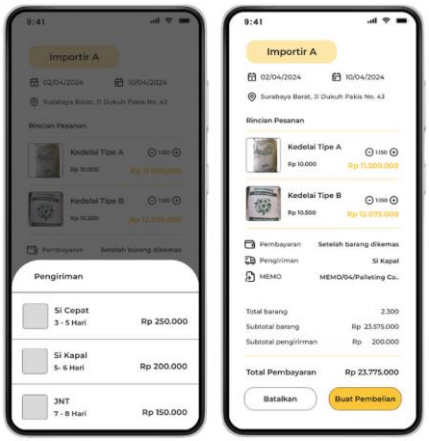


Source: (Research Result, 2025)
Figure 19. Inventory Page

When a user selects the "Purchase" page from the navigation menu, they will be presented with two options: viewing the purchase status or creating a new purchase. To create a new purchase, users will select the desired product and quantity. Next, they will choose an importer based on their budget and requirements. Once an importer is selected, users will choose a shipping company and attach a previously created MEMO. Upon completion, the new purchase will automatically be added to the purchase status page. Refer to Figure 20 and Figure 21 for the prototype design.

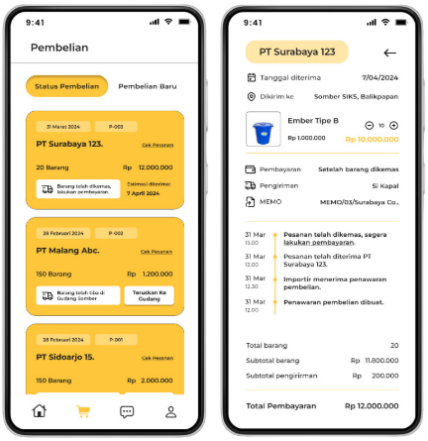


Source: (Research Result, 2025)
Figure 20. Purchase Page



Source: (Research Result, 2025)
Figure 21. Choose Delivery and MEMO

On the "Purchase Status" page, users will see information such as the expected arrival date, delivery address, ordered items and quantities, payment method, shipping company, MEMO, and the entire purchase process from quotation to goods arrival. Additionally, at the bottom, there is information about the total quantity of goods, subtotal of goods price, subtotal of shipping cost, and the total overall of the purchase. Refer to Figure 22 for the prototype design.



Source: (Research Result, 2025)
Figure 22. Purchase Status

Evaluation

To evaluate the prototype, we employed the System Usability Scale (SUS), a widely recognized usability testing method that effectively assesses user experience. Prior to implementing the SUS, we conducted a Validity Test and Single Ease Question (SEQ) Reliability Test to ensure the accuracy and consistency of the usability assessment. These preliminary tests strengthen the robustness of the SUS evaluation by confirming that the questionnaire appropriately measures usability aspects for KoptiHub.

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To verify the appropriateness of the SUS questionnaire, we conducted a Content Validity Index (CVI) assessment and expert judgment. The CVI score of 0.94 indicated that all items were relevant and suitable for evaluating KoptiHub's usability. Additionally, the SEQ was used to assess perceived ease of use after each task, with reliability measured using Cronbach's Alpha (α = 0.93), confirming high consistency in user responses. To ensure the SUS maintains internal consistency when applied to KoptiHub, we conducted a test-retest reliability check. The Cronbach's Alpha score (α = 0.85) demonstrated strong internal consistency, confirming that SUS results accurately reflect the user experience.

Following these preliminary tests, the SUS was administered to 15 active cooperative management members, representing 100% of the total cooperative administration team. SUS was selected due to its ability to provide a comprehensive and standardized assessment of usability, highlighting both strengths and areas for improvement.

Table 3 presents the numerical results of the SUS evaluation, including individual scores, total scores, and final SUS scores.

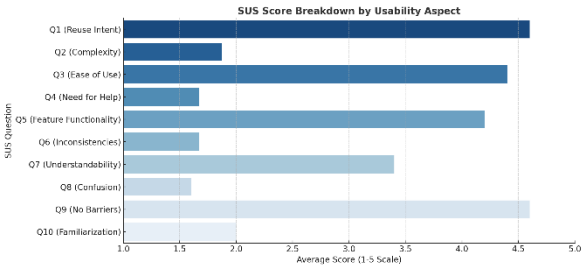
Table 3. SUS Calculations

Res	Data Respondents Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score Total	SUS Score (Score Total * 2,5)
1	4	2	5	2	4	2	5	2	5	1	34	85
2	3	1	4	1	3	2	2	2	3	2	27	67.5
3	5	2	4	1	4	2	2	1	5	2	32	80
4	5	2	4	1	4	1	5	1	5	1	37	92.5
5	5	2	4	1	4	1	5	1	5	1	37	92.5
6	5	2	5	3	5	1	3	1	5	1	35	87.5
7	5	2	4	1	4	2	2	1	5	2	32	80
8	5	2	5	3	5	1	3	1	5	1	35	87.5
9	5	2	5	2	4	2	3	2	5	2	32	80
10	5	2	5	3	5	1	3	1	5	1	35	87.5
11	5	2	5	2	4	2	3	2	5	2	32	80
12	5	2	4	1	4	2	2	1	5	2	32	80
13	5	2	4	1	4	2	2	1	5	2	32	80
14	4	2	5	2	4	2	5	2	5	1	34	85
15	3	1	4	1	3	2	2	2	3	2	27	67.5
											Average SUS Score	82.17
											Grade	A

Source: (Research Result, 2025)

The average SUS score of 82.17 categorizes KoptiHub as "Excellent", signifying high usability and strong user acceptance. Compared to previous warehouse management systems, which report SUS scores between 70-85 (Hägglund & Scandurra, 2021), KoptiHub demonstrates higher usability in cooperative-based inventory management. A digital drug management in puskesmas, for instance, reported a SUS score of 64.8, indicating that KoptiHub outperforms similar applications in terms of user experience and efficiency (Astutiany, Satibi, & Lazuari, 2023). Additionally, inventory management system for SMEs reach 80 in SUS score, reflecting more challenges in user experience due to complex interfaces (Tarigan, Damayanti, & Pratama, 2024). These comparisons highlight that KoptiHub is well-designed and exceeds usability expectations compared to similar applications in the cooperative and SME sector.

Despite an overall high usability rating, some aspects remain challenging for users. Q4 (Need for help) scored relatively high, indicating that some users still require assistance when using the system, suggesting the necessity for better onboarding and training materials. Q2 (Complicated to use) received moderate scores, which implies a learning curve for new users, particularly those unfamiliar with digital warehouse management systems. Additionally, Q6 (Inconsistencies in features) shows minor concerns regarding interface uniformity, indicating that some elements in the system may not follow a consistent design pattern. A data visualization of the SUS score breakdown (Figure 23) provides a clearer representation of how different usability components performed, offering valuable insights into specific areas requiring further optimization. By analyzing these results, it becomes evident that improvements should focus on reducing complexity, improving feature consistency, and enhancing user support mechanisms to create a more intuitive and accessible experience for cooperative members.



Source: (Research Result, 2025)

Figure 23. SUS Score Breakdown by Usability Aspects

CONCLUSION

The warehouse management application prototype was developed using a User-Centered Design (UCD) approach and evaluated using the System Usability Scale (SUS) to assess its usability and user acceptance. Core features, including daily news, notifications, incoming orders, reports,

MEMO, and inventory on the homepage; order creation and status tracking on the purchase page; as well as chat and profile features, were designed to effectively meet user needs.

The evaluation of KoptiHub using the System Usability Scale (SUS) revealed an overall usability score of 82.17, categorizing it as "Excellent." This high score indicates that the prototype effectively meets user needs and expectations, outperforming other warehouse management systems in cooperative settings. The results demonstrate that KoptiHub enhances efficiency in inventory tracking, procurement processes, and overall warehouse operations, positioning it as a viable digital solution for cooperative warehouse management.

Despite its strong usability, some areas require refinement. The need for assistance when using the system (Q4) suggests that enhanced onboarding materials and training could further improve user adoption. Additionally, moderate complexity in system navigation (Q2) indicates a learning curve for users unfamiliar with digital warehouse systems. Addressing these challenges by simplifying navigation, improving feature consistency, and integrating comprehensive user support mechanisms will enhance the overall experience.

Future developments should focus on refining usability while expanding functionality to accommodate evolving user needs. KoptiHub serves as a scalable and adaptable model for digitizing warehouse management in cooperatives and MSMEs, aligning with current trends in smart inventory management and supply chain optimization.

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