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Integrating RAD and Design Thinking for Developing a Web-Based POS and Inventory Management System for MSMEs: A Case Study

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Abstract—Manual transaction and inventory recording in micro, small, and medium enterprises (MSMEs) often leads to recording errors and delayed decisions. This study developed a web-based point-of-sale (POS) and inventory management system for Fresh Market Klatak to streamline transactions and stock control. Development followed Rapid Application Development (RAD) and was integrated with Design Thinking to elicit user needs and iterate on prototypes rapidly. The system was evaluated using scenario-based functional testing and user acceptance testing (UAT). All functional test scenarios passed (100%). UAT with 16 users produced an overall acceptance score of 93% (Very Good), indicating the system is usable and meets operational requirements. Future work will develop a mobile application and integrate payment-gateway services to improve accessibility and transaction efficiency.

Keywords—Point of Sale; SMEs; Rapid Application Development; Design Thinking; Inventory Management System; User Acceptance Testing.

I. INTRODUCTION

Technological and communication developments have had a major impact on various aspects of life, including business and trade [1]. Digitalization has driven business model innovation in the retail sector, with the potential to improve operational efficiency, strengthen competitiveness, and enhance adaptability to market changes [2]. Digital transformation in Indonesia's Micro, Small, and Medium Enterprises (MSMEs) sectors is also being driven by the implementation of website-based information systems that support efficient management and empowerment strategies [3]. The implementation of cloud-based Point of Sale (POS) systems has been proven to improve the operational efficiency and non-financial performance of MSMEs in Indonesia, as these systems accelerate transaction processes, improve recording accuracy, and facilitate business control [4].

Although the application of digital technology has been proven to improve business efficiency and productivity, its adoption rate in Indonesia's MSME sector remains relatively low. This condition aligns with [5], which confirms that limited human resources, organizational readiness, and digital infrastructure are the main factors affecting the low adoption of technology in small and medium-sized enterprises. At Fresh Market Klatak, for example, stock and transaction management are still conducted manually using physical books. This manual process often leads to delayed updates, errors in stock records, and difficulties tracking sales, hindering efficient inventory management and timely procurement decisions. These operational challenges highlight the need for a digital system that can automate both transaction recording and inventory management. Inaccurate inventory data often hinders stock management and procurement processes, as purchasing decisions are based on invalid or outdated data, thereby impacting the store's operational performance [6].

One solution to overcome operational problems and improve business efficiency is implementing a POS system. The POS system not only serves as a transaction recording tool but also plays an important role in supporting operational efficiency by enabling real-time management of stock, customer data, and suppliers [7]. Several traditional merchants have implemented integrated POS systems as part of their digital transformation. These systems help speed up transactions, reduce input errors, and improve the accuracy of operational data [8]. Therefore, it is proposed to develop a website-based POS system that integrates transaction and inventory management on a single platform.

Several studies have demonstrated the benefits of web-based POS and inventory systems for MSMEs. Research by [9]found that implementing a website-based POS system improves operational efficiency and speeds up transactions through automated sales recording. At the same time, [10] reported similar results for a website-based inventory information system. Research [11] also highlights that web-based, configurable information systems are crucial for supporting operational activities and improving data accuracy in small- to medium-scale businesses.

In previous studies, the Rapid Application Development (RAD) method has been proven to accelerate the system development cycle. This research [12] demonstrated that RAD is more flexible and time-saving than the linear, rigid waterfall method. Another study by [13] showed that combining the RAD method with projects enables manual sales systems to be converted into faster, more responsive website-based systems. However, the main weakness of RAD lies in the user design stage, where low user involvement can result in a system

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design that fails to meetser needs [14]. In an effort to address this shortcoming, the Design Thinking approach offers a solution by emphasizing deep user understanding, problem exploration, and solutions that focus on the user experience [15]. Previous studies have explored the RAD method and the Design Thinking approach in developing information systems. However, most of these studies tend to emphasize only one aspect, either accelerating development through RAD or improving user experience through Design Thinking, without clearly explaining how both approaches are systematically integrated, particularly in the context of web-based POS and inventory systems for MSMEs. This indicates a research gap: a lack of structured methodological integration that simultaneously supports rapid development and alignment with user needs.

To address this gap, the present research aims to design and evaluate a web-based POS and inventory system that integrates RAD and Design Thinking in a complementary manner. The system is designed to automate transaction recording and stock updates, minimize errors, provide real-time sales and inventory reports to support timely procurement decisions, and improve overall operational efficiency. Through this approach, MSME operators are expected to manage transactions and inventory more effectively, reduce recording errors, and make faster, data-driven procurement decisions, while benefiting from a development process that is both efficient and practical for users. By clarifying the integration of these two approaches, this research contributes to existing studies by demonstrating a practical, user-focused system development approach in which RAD and Design Thinking are commonly applied separately.

II. Research Methodology

The RAD method is a system development approach that emphasizes a relatively short system development cycle to make the system creation process more efficient [16]. The main advantage of the RAD method lies in its ability to accelerate development time through rapid iteration and to obtain direct user feedback [17].

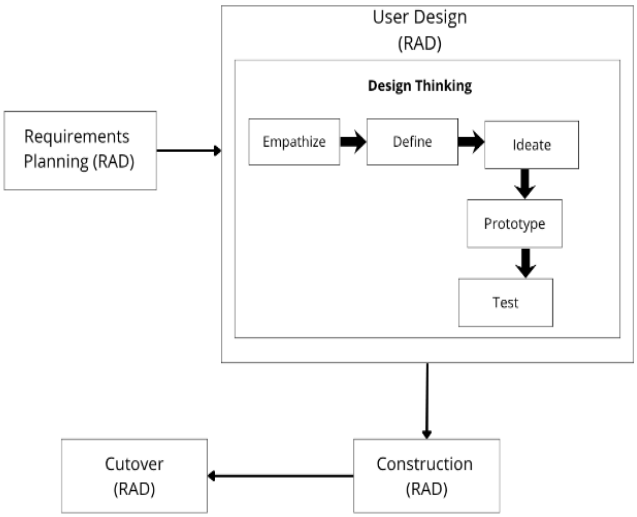

Fig. 1. Proposed Model

The RAD method is applied in POS and inventory systems to accelerate the process of needs analysis, interface design, and system evaluation, which are carried out in stages. To strengthen the design and user experience, Design Thinking is applied early to understand user needs, identify problems, and create prototypes that reflect user expectations. Once the prototype is validated, the project transitions to RAD, enabling rapid, iterative system development, testing, and integration. Although the RAD method emphasizes speed and iterative development, it still has limitations in deeply understanding user needs, particularly during the user design stage [18]. As shown in Fig. 1, the RAD method is integrated with the Design Thinking method during the User Design stage to strengthen empathetic design and validation. This integration ensures that the system is developed more efficiently while remaining aligned with user requirements [19]. The sequence of stages of the proposed method is as follows:

1) Requirements Planning: A stage of system development, problem identification, by analyzing user needs through interviews and observation [20]. This technique has been proven effective in previous studies, in which interviews with store owners and observations of sales processes and product management provided a more accurate understanding of the issueshe system needed to resolve [21].

2) Empathize: A process carried out to understand user needs and problems, motivations, and activities [22].

3) Define: A stage of formulating the main problems based on the results of empathy so that the design direction is more focused [22].

4) Ideate: Acarried out by developing various creative solution ideas that can answer user needs [22].

5) Prototype: Create an initial design of the interface and system flow for quick testing [22]. The prototype was created in Figma.

6) Testing: A prototype is evaluated with users to obtain relevant feedback [19]. The prototype was evaluated by 4 participants on Figma, all of whom regularly handle sales and inventory tasks at the fresh market, to obtain relevant feedback on the interface and system workflow. They performed tasks such as navigating menus, adding products, completing transactions, and updating data. The small sample size is justified because this testing focuses on early-stage prototype evaluation, aiming to identify usability issues quickly before full-scale deployment. Each task completed was treated as the unit of observation, and each session lasted about 60 minutes per user. The success rate was calculated using Equation (1). At the same time, overall performance was summarized using the mean and standard deviation (SD) to represent both the average level of task completion and the consistency of the results. The SD was calculated using Equation (2). Where, the x_i denotes the success rate for each task, the $\bar{x}$ variable represents the mean success rate, and n refers to the total number of observed tasks. Several validity threats could affect

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the results of prototype testing. Users may perform better on tasks over time as they become more familiar with the system, potentially artificially increasing success rates. Additionally, the small sample size may introduce sample bias, limiting the generalizability of the results. To mitigate these threats, users were given a brief training session before testing, and each task was clearly defined and observed individually to ensure consistent measurement.

$$Success\ Rate\ (\%) = \frac{Total\ success}{Number\ of\ users} \times 100 \quad (1)$$

$$SD = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n}} \quad (2)$$

7) Construction: The process of developing the system based on the design results that have been validated s in the previous stage. Testing is carried out in stages to ensure functionality and user comfort [23]. Work in the Construction phase includes writing program code, integrating modules, and conducting initial testing of system functionality. Each module is tested in stages to minimize errors before the system is fully integrated. The development process uses the Laravel 10 framework for the backend and the Blade Template Engine for the frontend. The database used is MySQL, and the interface design is based on the prototype results from the previous stage.

8) Cutover: The final stage that helps ensure the system runs as required and in line with real-world usage scenarios. Testing uses two approaches: Scenario-Based Testing (SBT) and User Acceptance Testing (UAT) [23]. The UAT was conducted with 16 respondents who regularly handle store operations to evaluate system performance in real-world conditions. Participants were asked to complete a questionnaire consisting of 14 test items to assess directly, using a 1-5 Likert scale, as listed in Table I. Participation was voluntary, and all responses were kept confidential. The Likert scale was used to assess the system using 14 statement items covering aspects of usability, functional suitability, and user satisfaction, as shown in Table II.

TABLE I
LIKERT SCALE DESCRIPTION

Weight	Description
1	Strongly Disagree (STS)
2	Disagree (D)
3	Somewhat Agree (SA)
4	Agree (A)
5	Strongly Agree (SA)

TABLE II
TEST STATEMENT

Statement	P
The system can display product data correctly.	P1
The cashier transaction feature functions as needed.	P2
The system automatically updates stock after transactions.	P3
The login and logout processes work correctly.	P4
The system interface is easy to understand and use.	P5
The menu and navigation buttons are easy to find.	P6
Users can complete transactions without difficulty.	P7
The system responds quickly to every action.	P8
No errors or crashes occur during transactions.	P9
Attractive and user-friendly interface design	P10
Information on the page is easy to read and not confusing	P11
The system helps speed up the transaction process.	P12
The system simplifies product and inventory data management.	P13
Overall, the system meets user needs.	P14

The UAT instrument consisted of 14 Likert-scale statements, rated on a five-point scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The maximum possible score for each respondent is 70. To obtain objective evaluation results, the scores are normalized into percentages using Equation (3). Where mean represents the average score across all Likert-scale responses, and maximum weight refers to the highest possible total score a respondent can achieve. The resulting percentage values indicate the level of user acceptance of the system. After that, the average percentage will be assessed based on the following score interpretation Table III.

$$UAT\ Percentage = \frac{Mean}{maximum\ weight} \times 100\% \quad (3)$$

TABLE III
SCORE INTERPRETATION

Percentage	Description
0% - 20%	Very poor
21% - 40	Poor
41% - 60%	Fair
61% - 80%	Good
81% - 100%	Very good

Several factors could affect the validity of SBT and UAT results. As participants become more familiar with the system, task performance may improve beyond first-time usage levels. Additionally, the limited number of respondents may reduce the generalizability of the findings. To reduce these risks, testing tasks and scenarios were randomized, participants were selected to cover a range of experience levels, and clear, step-by-step instructions were provided before testing to ensure consistent and reliable evaluation.

III. RESULTS AND DISCUSSION

A. Requirements Planning

The outcomes of this stage are presented in Table IV, which summarizes the system requirements identified based on user needs.

TABLE IV
FUNCTIONAL AND NON-FUNCTIONAL REQUIREMENTS

Functional Requirements	Non-Functional Requirements
Users can manage product data in the system.	The system is equipped with login authentication and access restrictions based on user roles (admin & cashier).
Users can create and update product categories.	The system interface is designed to be simple and easy to understand, requiring no additional training.
The system automatically reduces product stock according to the number of products sold.	The system can be run on modern browsers (Chrome, Firefox, Edge) and desktop devices.

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Functional Requirements	Non-Functional Requirements
The system can display reminder notifications when product stock falls below the minimum threshold.	The system's code structure is modular, using the Laravel framework for easy maintenance and development.
Users can select and add products to the cart for transactions.	The system can be accessed at any time as long as there is an internet connection.
Users can access the cashier and admin pages according to their assigned roles.	The system can store data consistently without losing data.

B. User Design

1) Empathise: Based on observations, the transaction and product management processes are still carried out manually, as shown in Table V. This manual process often leads to delays in stock recording, transaction calculation errors, and slow responses to product restocking requests. The observation results form the basis for designing the POS system to address issues of efficiency and data accuracy.

TABLE V
USER EMPATHY MAP

Says	We still calculate the total price manually. There are often discrepancies between stock records and physical stock. Forgot to update stock data after a transaction. Must open today's record recap to see transaction history Inventory data is not stored properly.
Thinks	How can transactions be made faster and more accurate? Is it possible for transaction and inventory data to be immediately visible without having to re-enter the data? How can all inventory history be automatically saved and not easily lost? Calculate the total price using a calculator. Comparing the physical quantity of goods with manual records
Does	Rewriting stock records after sales are complete Check sales records at the end of each day. Write down transactions in a logbook. Tired Confused when there is a stock discrepancy
Feels	Overwhelmed Troublesome and worried Anxious because the data is not secure Is it possible for transaction and inventory data to be immediately visible without having to re-enter the data? How can all inventory history be automatically saved and not easily lost?

2) Define: Based on the results of the previous stage, several major issues were identified that hindered operational efficiency at Fresh Market, as summarised in Table VI. Based on these findings, Table VII was compiled to map out the details of user requirements. This was compiled as a basis for designing a website-based POS and inventory management system.

TABLE VI
RESULT OF USER ISSUES

Key Issues	Transactions are processed manually using a calculator. Inventory recording is still done manually using notebooks. Difficulty monitoring fast-moving inventory. Difficulty viewing transaction data in real time. Transaction data is not stored properly.
Reasons	Cashiers take longer to calculate the total price and often make calculation errors. The recording process is inefficient and prone to delays when the store is busy. There are no notifications or indicators for low stock levels. Transaction and stock data updates are not automatic. There is no centralized storage.
Impact	Potential errors in transaction calculations. Discrepancies between physical stock and records Delays in product procurement Difficulty in determining current stock and transaction status. Risk of data loss or incompleteness.
User needs	Users need a system that automatically calculates the total price and saves transaction data directly. Users need a feature that automatically updates stock after a transaction is completed. Users need an automatic reminder feature when inventory reaches the minimum threshold. Users require a feature for real-time recap and updates of stock and transaction data. Requires a system integrated with a database to store data securely.

TABLE VII
RESULT OF USER REQUIREMENTS DETAILS

System Page	Requirements
Dashboard Page	Displays general information such as transaction history, sales charts, total number of employees, total revenue for the day, and total products sold.
Product and Inventory Management Page	Displays and facilitates product management, including adding new products, editing product data, changing product sales status, managing product inventory, and viewing product inventory history.
Transactions and Payments Page	Displays products currently being sold and used to serve customers and process transactions.
User Management Page	Allows admins to view and manage users when access changes.
Supplier Management Page	Displays and stores information about product suppliers.

3) Ideate: The user flow diagram in Fig.2 shows the user's interaction with the Fresh Market Klatak POS system. The process starts from the login page, then the system validates the user account. The user flow provides an overview of the system's functions. It serves as the basis for developing use cases, which describe each user action in detail and its interactions with the system. The designed Use Case Diagram in Fig. 3 serves as a reference for the initial testing of functionality and user requirements.

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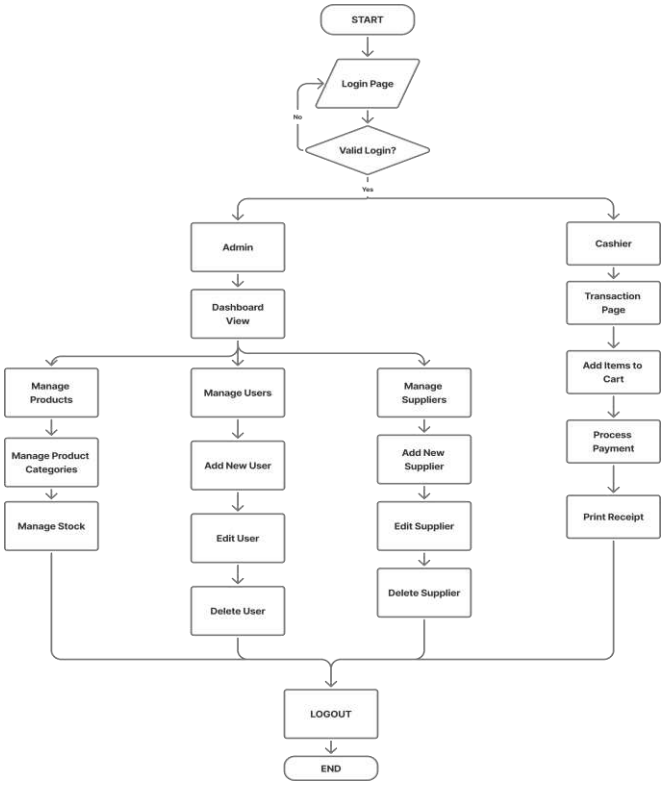

Fig.2. User Flow

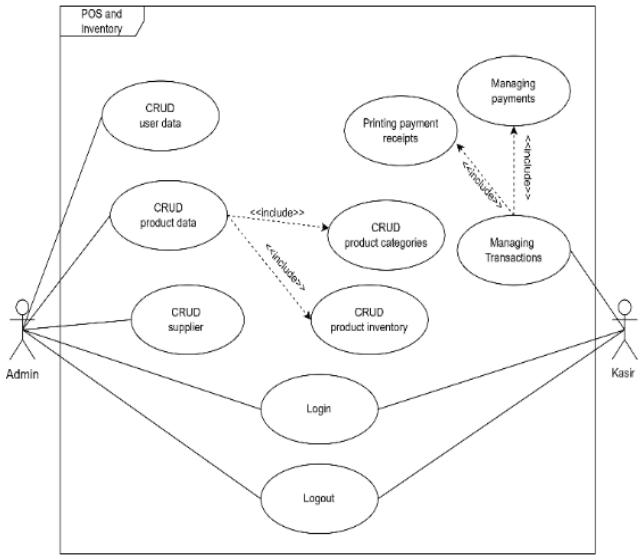

Fig.3. Use Case Diagram

4) Prototype: The display in Fig. 4 depicts a prototype of a web-based Point of Sale system interface designed to support transaction processing, product management, and sales monitoring. The prototype shows how the main functions are mapped into a structured interface design. The login page serves as a simple and secure authentication stage. After the user logs in, the cashier page provides product selection, search, category filter, and shopping cart management features to support a more efficient transaction flow. The payment page displays a transaction summary that clearly shows the total price, number of products, and change calculation. In the management section, the dashboard displays sales summaries, the number of products, total revenue, and daily sales performance graphs. In addition, the stock management page design shows the flow of stock change records, which are projected to be displayed in Tables for easy monitoring. Overall, the prototype shows the direction of the system design, which focuses on clarity of workflow, reduction of manual errors, and improved ease of monitoring operational data. The resulting design provides an initial overview of the expected user experience and serves as a basis for evaluation before entering the actual development stage. Thus, the prototype significantly helps ensure that user needs are accurately mapped before implementation.

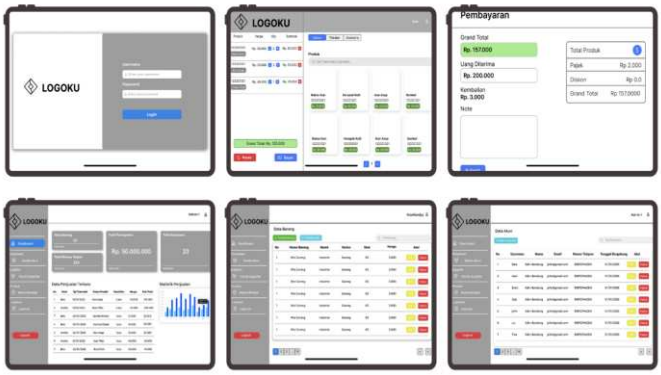

Fig. 4. Prototype System

5) Testing Prototype: The results of the prototyping test calculations are presented in Table VIII. Based on the prototype testing results shown in Table VIII, the five tested features achieved an average success rate of 90% with a standard deviation of 13.69, indicating moderate variation in task success across features. Three features (F1, F4, and F5) achieved a perfect 100% success rate, while F2 and F3 recorded a 75% success rate due to minor execution errors during testing. This variation indicates that although the system's core functions operate reliably, some interaction flows still need improvement, especially for first-time users. The decrease in success rates observed in F2 and F3 indicates that errors occur more often in features involving sequential steps, suggesting that further improvements in usability design are needed. Overall, the results indicate that the developed prototype functions properly, supports smoother operational processes, and reduces the potential for errors during system use.

TABLE VIII
PROTOTYPE TESTING RESULTS

Features (F)	Users	Successful	Failed	Success Rate (%)
F1	4	4	0	100%
F2	4	3	1	75%
F3	4	3	1	75%
F4	4	4	0	100%
F5	4	4	0	100%
Mean				90%
Standard Deviation				13.69

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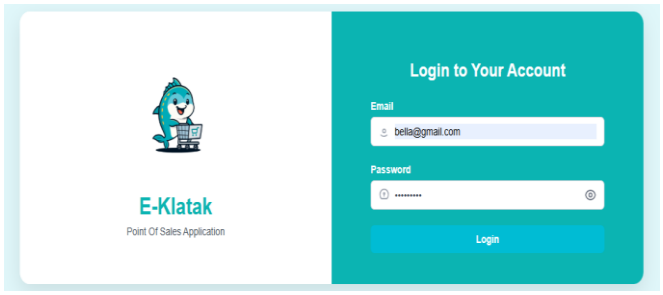
C. *Construction*

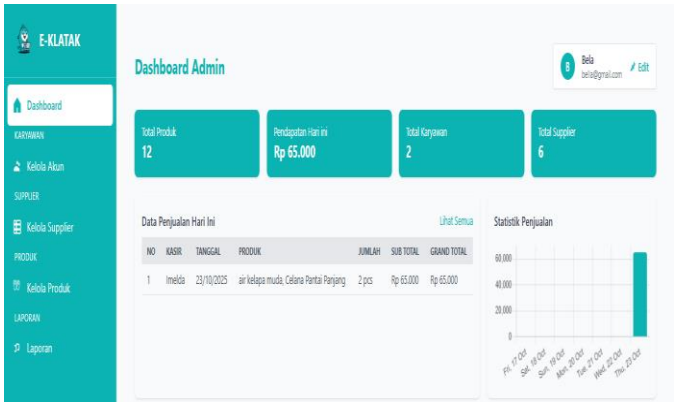
The results of the Construction phase are demonstrated through several main system interface views. Fig.5(a) illustrates the main gateway of the system, which differentiates access rights for Admin and Cashier users. Fig. 5(b) shows the Dashboard page displayed to users with admin roles after successful login, which shows summary information such as the number of products, products with low stock, and total daily transactions. This display can help users quickly monitor the store's condition in real time.

The product management page shown in Fig.5(c) manages all product information, including adding, updating, and deleting product data. The product management page also displays notifications when stock reaches the minimum stock limit. Fig.5(d) shows the Stock Management page, which records all inventory changes in a structured stock change log. Automatic and manual stock adjustments are consistently stored, enabling transparent tracking of inventory movements. This functionality supports more accurate stock monitoring and reduces discrepancies between recorded and physical inventory.

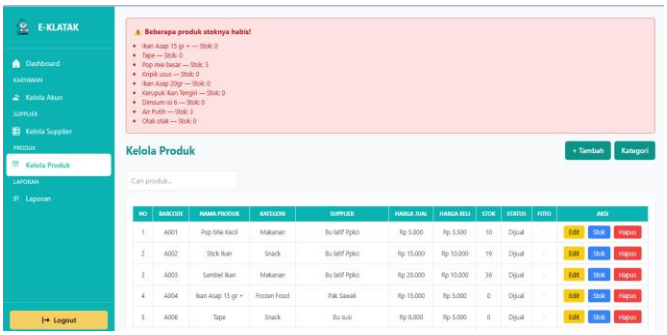
After logging in, in Fig.5(e), users with the cashier role will be directed to the transaction page. The system displays a product catalogue equipped with an "Add" button to add products to the cart. The system can automatically calculate the total price, tax, and total. After all products have been entered and the total purchase has been calculated, the cashier will press the "Pay" button to proceed to the payment page. Fig.5(f) shows the payment interface used to finalize transactions. The page provides a clear transaction summary and payment entry, enabling faster transaction completion and reducing calculation errors during the payment process.



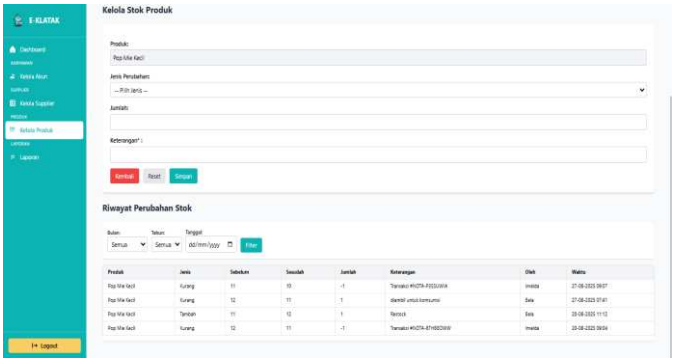
(a)Login Page



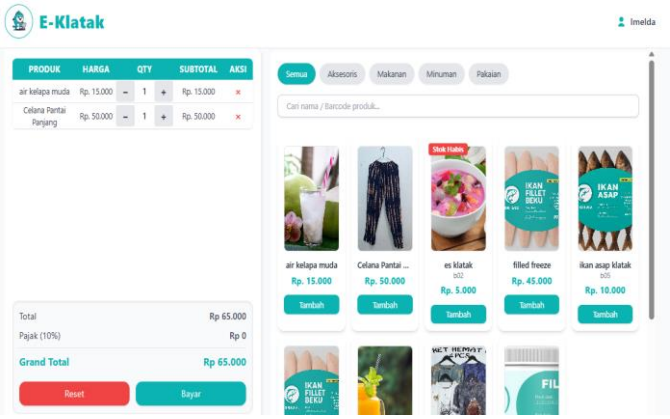
(b)Dashboard Page



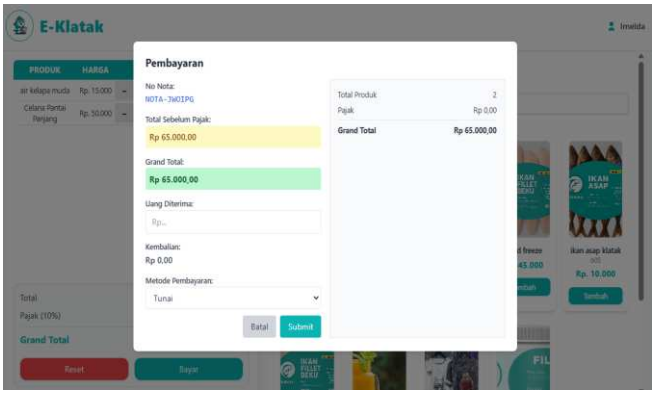
(c)Product Management Page



(d)Stock Management Page



(e)Transaction Page



(f)Payment Page

Fig.5. System Interface Views

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D. Cutover

Scenario-based testing was conducted on the POS and web-based systems at Fresh Market Klatak, using 3 test samples representing the cashier and admin roles. Each scenario is based on business processes that occur in the field, such as login, product management, sales transactions, transaction cancellations, and system logout, as listed in Table IX. If an activity can be performed by both roles, namely admin and cashier, then the actor is written as user; activities that can only be performed by a specific role are written according to that role's access rights. Test results show that 100% of scenarios run as expected. The system performs its main functions well, including displaying product data, automatically reducing stock after transactions, and printing payment receipts. This result indicates that the implemented business processes are well aligned with operational workflows, enabling the system to function reliably in real-world use cases. Based on these results, it can be concluded that the POS and *inventory* systems have met user needs functionally and can be used effectively in store operations.

TABLE IX
SYSTEM TESTING SCENARIOS RESULT

Testing Scenario	Testing Steps	Expected Results	Results Test
User logs in to the system.	The user enters their username and password based on their role (Admin/Cashier), then presses the "Login" button.	The system displays the dashboard or transaction page according to the	Correct
User fails to log in due to invalid credentials.	The user enters the wrong username and password	The system displays an error message and denies access.	Correct
The admin adds new product data.	The admin opens the product menu, fills out the add product form, and clicks the save button.	The new product is saved in the database and appears in the product list	Correct
The admin updates the product data.	The admin selects the product to be edited, clicks the edit button, makes changes, and then clicks the save button.	The system displays the product edit page and saves the updated data	Correct
The admin deletes the product data.	The admin clicks the delete button on the product list	The system displays a confirmation message and deletes the data from the database	Correct
The admin adds a product category.	The admin clicks the add category button available on the product management page, then adds the desired product category.	The system displays the product category page and saves the category in the database.	Correct
The admin updates the product stock.	The admin clicks the existing stock button, then updates the product's stock.	The system displays the stock management page and saves the stock changes in the database.	Correct
The admin adds supplier data.	The admin clicks the " Add Supplier " menu, then fills in the desired supplier data.	The system displays the supplier page and saves the supplier data to the database.	Correct
The cashier conducts a sales transaction.	The cashier selects products, adds them to the cart, determines the purchase quantity, and completes the payment.	The system displays the cashier page, adds the selected products to the cart, automatically reduces the stock, and displays the total payment.	Correct
The cashier cancels the transaction before payment	The cashier presses the "Cancel" button before payment confirmation	The system will return to the transaction page, not save the transaction, and the stock remains unchanged	Correct
The cashier prints the purchase receipt.	The cashier enters the amount of money and the customer's payment method, then presses the submit button.	The system will save the amount of money and payment method in the database and print the purchase receipt.	Correct
The user logs out of the system	The user presses the "Logout" button provided	The system ends the session and displays the login page	Correct

User Acceptance Testing (UAT): The results of the User Acceptance Testing (UAT) are presented to describe user acceptance of the developed web-based POS and inventory system. The assessment involved 16 respondents who interacted directly with the system and subsequently completed a questionnaire comprising 14 evaluation items, rated on a five-point Likert scale. To provide a more representative description of user responses, the analysis employed median values and interquartile ranges (IQR) for each item, as these measures are suiTable for ordinal data and are less sensitive to extreme values. As shown in Table X, all evaluation items achieved median scores of 4.5 or higher, indicating strong user agreement across all assessed aspects. The relatively narrow IQR values, ranging from 0.00 to 1.00, indicate low variability in user responses, reflecting consistent perceptions of system performance and usability. In addition to the item-level analysis, the overall user acceptance level was calculated by aggregating respondents' scores and converting them to a percentage. The system achieved an overall acceptance score of 93%, as illustrated in Fig. 11.

TABLE X
UAT ITEM STATISTICS RESULT

Item	Median	IQR
P1	5	0.25
P2	5	1
P3	5	0

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Item	Median	IQR
P4	5	1
P5	5	0.25
P6	5	1
P7	5	0.25
P8	5	1
P9	5	1
P10	5	1
P11	4.5	1
P12	5	1
P13	5	1
P14	5	1

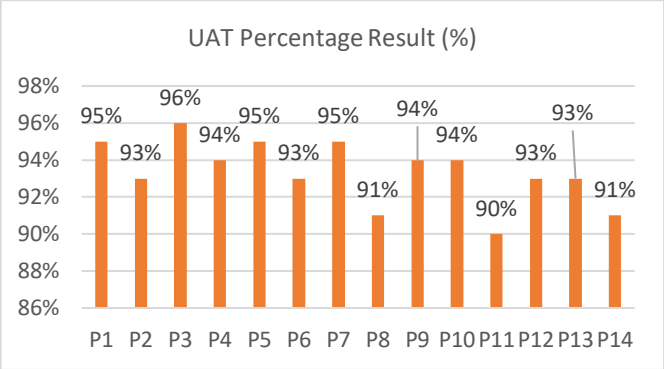

Fig.6. UAT Presentage Result

According to the acceptance criteria defined in Table III, this score falls into the "Very Good" category, indicating that the developed POS and inventory system is highly accepTable and well aligned with the users' operational needs at Fresh Market Klatak. Test results indicate that all defined scenarios were successfully executed, demonstrating that the system consistently supports essential operational workflows, including product management, transaction processing, stock updates, and receipt generation. Beyond confirming functional correctness, this result reflects the system's robustness in handling real-world operational sequences without interruption. Compared to previous studies on web-based POS systems for MSMEs [9][10], which reported occasional inconsistencies in stock synchronization and transaction logging, the proposed system demonstrates improved reliability in maintaining data consistency between transactions and inventory records.

From a practical perspective, this reliability reduces operational risk, minimizes human error, and increases cashier efficiency during peak transaction periods. The findings also suggest that closely aligning system workflows with actual business processes is a critical factor for achieving sTable system performance in small retail environments. However, this study has several limitations. The evaluation was conducted in a single retail environment with a limited number of respondents, and the system has not yet been integrated with advanced features such as a payment gateway, mobile application access, or sales forecasting. Future work may explore these additions to enhance system functionality and accessibility.

IV. Conclusion

This study concludes that the developed web-based Point of Sale (POS) and Inventory Management System is functionally reliable and well accepted by users at Fresh Market Klatak. Empirical evidence from the evaluation phase shows that all defined business scenarios were successfully executed, with Scenario-Based Testing achieving a 100% pass rate across core workflows, including login, transaction processing, inventory management, and reporting functions (Table IX). Furthermore, User Acceptance Testing (UAT) involving 16 respondents yielded an overall acceptance score of 93%, classified as Very Good, indicating a high level of usability, functional suitability, and user satisfaction (Fig.11).

These results demonstrate that integrating Rapid Application Development (RAD) and Design Thinking effectively supports rapid system development while maintaining alignment with operational needs. The RAD approach facilitated iterative implementation and continuous refinement based on user feedback. In contrast, Design Thinking ensured that system workflows and interface designs addressed real user problems identified during the empathy and prototyping stages. This methodological integration improved transaction efficiency, enabled automatic stock updates, and provided more accurate operational data to support informed decision-making.

Nevertheless, several limitations should be acknowledged. The system was evaluated in a single-store context and employed a non-experimental, descriptive evaluation approach, which limits the generalizability of the findings to other MSME settings. In addition, the evaluation focused on short-term system usage and did not assess long-term performance, scalability, or system resilience under higher transaction volumes.

Future work should address these limitations by integrating a payment gateway to enable secure cashless transactions and by developing a mobile phone application to enhance accessibility, mobility, and real-time operational control for store owners and cashiers. Further enhancements may include support for multi-branch management, system failure logging, and data quality auditing mechanisms to improve system reliability and enable more accurate, data-driven decision-making in MSME operations.

References

[1] OECD, "The Digital Transformation of SMEs," OECD Publishing, Feb. 2021. doi: https://doi.org/10.1787/bdb9256a-en.

[2] R. Mostaghel, P. Oghazi, V. Parida, and V. Sohrabpour, "Digitalization driven retail business model innovation: Evaluation of past and avenues for future research trends," *J Bus Res*, vol. 146, pp. 134–145, Jul. 2022, doi: 10.1016/j.jbusres.2022.03.072.

[3] L. Zahrotun, Y. R. Amanatullah, U. Linarti, and A. H. Soleliza Jones, "Strategy for improving and empowering MSMEs through grouping using the AHC method," *Jurnal Sisfokom (Sistem Informasi dan Komputer)*, vol. 13, no. 1, pp. 130–136, Feb. 2024, doi: 10.32736/sisfokom.v13i1.2021.

[4] Y. W. Prihatiningtias and M. R. Wardhani, "Understanding the effect of sustained use of cloud-based point of sales on SMEs performance during covid-19 pandemic," *The Indonesian Accounting Review*, vol. 11, no. 1, pp. 33–46, Mar. 2021, doi: 10.14414/tiar.v11i1.2300.

[5] F. Faiz, V. Le, and E. K. Masli, "Determinants of digital technology adoption in innovative SMEs," *Journal of Innovation and Knowledge*, vol. 9, no. 4, Oct. 2024, doi: 10.1016/j.jik.2024.100610.

DOI : https://doi.org/10.25139/inform.v11i1.11205

[6] A. Shabani, G. Maroti, S. de Leeuw, and W. Dullaert, "Inventory record inaccuracy and store-level performance," *Int J Prod Econ*, vol. 235, May 2021, doi: 10.1016/j.ijpe.2021.108111.
[7] D. Velicia Eliezer, "Understanding POS ABC Adoption in Indonesia: A Quantitative Analysis Using Modified UTAUT," 2025.
[8] M. E. Isharyani, B. M. Sopha, M. A. Wibisono, and B. Tjahjono, "Retail technology adaptation in traditional retailers: A technology-to-performance chain perspective," *Journal of Open Innovation: Technology, Market, and Complexity*, vol. 10, no. 1, Mar. 2024, doi: 10.1016/j.joitmc.2023.100204.
[9] F. A. M. Andy and S. Widiono, "Inovasi Teknologi dalam Manajemen Penjualan: Aplikasi Point of Sales Berbasis Web untuk UMKM," *Infomatek*, vol. 26, no. 2, pp. 161–174, Nov. 2024, doi: 10.23969/infomatek.v26i2.19007.
[10] N. A. C. Qisthina, M. Andarwati, and D. M. Putri, "Desain sistem informasi inventaris barang untuk Usaha Mikro Kecil dan Menengah (UMKM) berbasis website," *Journal of Information System and Application Development*, vol. 3, no. 1, Apr. 2025, doi: 10.26905/jisad.v3i1.15396.
[11] H. Dinata, "Analisis dan Perancangan Sistem Informasi Produksi yang Dapat Dikonfigurasi pada Perusahaan Garmen dan Karpet," *Inform : Jurnal Ilmiah Bidang Teknologi Informasi dan Komunikasi*, vol. 4, no. 4, pp. 21–26, Jan. 2019, doi: 10.25139/inform.v3i2.1010.
[12] D. Murdiani and H. Hermawan, "Perbandingan Metode Waterfall Dan Rad (Rapid Application Development) Pada Pengembangan Sistem Informasi," *Jurnal Teknologi Informasi)*, vol. 6, no. 1, pp. 14–23, 2022.
[13] M. Calvin Septiano, N. Saka Lena, R. Oktavianti, M. Dwi Afdhol, and S. Rahayu, "Sistem Informasi Penjualan Hasil Perkebunan Berbasis Web menggunakan Metode Hybrid Waterfall RAD," *Klik - Jurnal Ilmu Komputer*, vol. 5, no. 2, pp. 62–69, 2024, doi: https://doi.org/10.56869/klik.v5i2.601.
[14] S. Makmun, "Efektivitas Metodologi Rapid Application Development (RAD) Dalam Pengembangan Sistem Informasi Manajemen (SIM) Untuk Lembaga Pendidikan," *Al-Jawwad: Jurnal Keislaman dan Pendidikan*, no. 1, pp. 1–18, 2025.
[15] S. Soedewi, "Penerapan Metode Design Thinking Pada Perancangan Website UMKM Kirihuci," *Visualita Jurnal Online Desain Komunikasi Visual*, vol. 10, no. 02, p. 17, Apr. 2022, doi: 10.34010/visualita.v10i02.5378.
[16] S. Lina, M. Sitio, S. Kom, and M. Kom, *Penerapan Metode Rapid Application Development (RAD) Untuk Aplikasi E Learning Berbasis Web Penerbit CV.Eureka Media Aksara*. Eureka Media Aksara, 2023.
[17] L. Triana, R. Andryani, and K. Kurniawan, "Aplikasi Monitoring Data Imunisasi Berkala Untuk Meningkatkan Pelayanan Posyandu Menggunakan Metode RAD Berbasis Android," *Jurnal Sisfokom (Sistem Informasi dan Komputer)*, vol. 10, no. 1, pp. 106–112, Mar. 2021, doi: 10.32736/sisfokom.v10i1.1039.
[18] A. J. Masaid, P. Suseno, M. Akhmal, A. Raidhan, and I. Setiawan, "Rancang Bangun Sistem Informasi Layanan Masyarakat Menggunakan Model Rapid Application Development (RAD) Studi Kasus Desa Harjatani," *JURNAL DIGIT*, vol. 14, no. 2, pp. 179–187, 2024.
[19] F. Lanitasya Shaghira, H. Tolle, and D. Cahya Astriya, "Perancangan User Experience Aplikasi Among Batu Menggunakan Metode Design Thinking," *Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer*, vol. 9, no. 5, pp. 2548–964, 2025.
[20] R. T. Aldisa, "Penerapan Metode RAD (Rapid Application Development) Pada Sistem Informasi Promosi dan Pemesanan Makanan Berbasis Website Studi Kasus Restoran Waroenk Anak Kuliahan," *Building of Informatics, Technology and Science (BITS)*, vol. 3, no. 3, pp. 446–452, Dec. 2021, doi: 10.47065/bits.v3i3.1137.
[21] I. N. Pramesty and A. Ariesta, "Business Model Canvas for Usability Testing of E-Commerce Website Design Using SEO On-Page Technique," *Inform : Jurnal Ilmiah Bidang Teknologi Informasi dan Komunikasi*, vol. 6, no. 2, pp. 93–102, Jul. 2021, doi: 10.25139/inform.v6i2.3947.
[22] V. A. Subarjah and Ari Purno Wahyu, "Analysis and Design of User Interface and User Experience of Regional Tax Enterprise Resources Planning System with Design Thinking Method," *Inform : Jurnal Ilmiah Bidang Teknologi Informasi dan Komunikasi*, vol. 7, no. 2, pp. 96–106, Jul. 2022, doi: 10.25139/inform.v7i2.4729.
[23] A. Firmansyah and A. Aditya Permana, "International Journal of Intelligent Systems And Applications In Engineering Design and Development of Online Learning Application Web Based Using Rapid Application Development Method: A Case Study of SMK Bintang Nusantara," *Original Research Paper International Journal of Intelligent Systems and Applications in Engineering IJISAE*, vol. 2024, no. 4, pp. 2398–2404, 2024.

DOI : https://doi.org/10.25139/inform.v11i1.11205