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Empowering Efficiency: A Web-Based Inventory and Sales Information System for Drinking Water Distributors through Rapid Application Development

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Abstract

Micro, Small, and Medium Enterprises (MSMEs) are vital for a country's economy, fostering job creation and economic growth. This research focuses on MSME water distribution agents engaged in selling and distributing various brands and types of bottled drinking water. With a customer base exceeding a thousand and an average of 30 daily transactions, these agents encounter specific challenges in inventory and sales reporting. Presently, MSMEs rely on traditional methods, using books to record stock and sales reports, manually calculating transactions with calculators, and preparing handwritten paper invoices. These practices often result in writing errors, inaccuracies in product information, and pricing inconsistencies. Furthermore, the manual nature of these processes consumes significant time and effort on a daily basis. This study highlights the applicability of the Rapid Application Development (RAD) system design method in creating an efficient and time-sensitive solution. By leveraging RAD, the system design was swiftly accomplished with a limited team. The traceability matrix test validates the successful alignment of the designed information system with the needs of MSME agents in the drinking water distribution sector. The findings of this study provide compelling evidence that the RAD system design approach significantly enhances inventory and sales management practices for MSMEs involved in drinking water distribution. By implementing the developed information system, MSME agents can streamline their operations, eliminate manual errors, and improve overall efficiency, thereby fostering their growth and success in the market.

Keywords: Information Systems, Inventory, MSME, RAD, Sales.

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play a pivotal role in driving the economy forward, making it imperative to facilitate their digital transformation [1]. The growth of MSMEs is evident from the data provided by the Ministry of Cooperatives and Small and Medium Enterprises (Kemenkop UKM), projecting a total of 8.71 million MSMEs in Indonesia by 2022 [2]. By December 2022, there were already 20.76 million digitally onboarded MSMEs, with a target of 24 million MSMEs entering the digital ecosystem in 2023 [3].

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This research focuses on MSMEs in Banten Province, Indonesia, specifically the Drinking Water Distribution Agents. These MSMEs sell and distribute various types and brands of bottled drinking water, including gallons and bottles of different sizes. Established in 2019, these MSMEs cater to a customer base exceeding 1000, engaging in an estimated >30 daily transactions. However, they encounter challenges in recording inventory and sales reports. Currently, these processes are performed manually using books for record-keeping and calculators for transaction calculations. Sales invoices are handwritten, leading to frequent writing errors and inaccurate information regarding product details and prices. Moreover, the conventional business processes demand a significant amount of time to complete on a daily basis.

The changing consumer behavior in the digital era presents both opportunities and challenges for MSMEs to expand their market reach. Utilizing information technology can optimize their business and marketing processes [4]. The owner's active involvement significantly influences the maturity level of Business Process Orientation (BPO), impacting the readiness for implementing information technology (IT). As MSMEs experience business growth, it becomes crucial for them to adapt to evolving market conditions and actively seek new opportunities to expand their customer base. The use of IT has proven to enhance effectiveness, efficiency, and overall business productivity, beyond serving as a marketing tool. It aids in implementing business process management practices [5].

After conducting an extensive literature review, it is evident that MSMEs of Drinking Water Distribution Agents would greatly benefit from implementing information technology (IT) in their business processes. Several studies emphasize the relevance of IT applications suitable for SMEs, with information systems being a particularly accessible option. Implementing an information system enables MSMEs to record, process, and integrate data, generating accurate information tailored to their specific needs [6].

This study focuses on developing a website-based information system to address these requirements. The website platform was chosen for its user-friendly accessibility. The key features of the proposed system for MSMEs include Inventory Management, Transaction Management, and Sales Reports. Further literature review revealed that the Rapid Application Development (RAD) method is suitable for achieving a timely system design with limited resources [7]. The final phase of this research involves testing the website-based information system using the Black-box testing method. This rigorous system test aims to validate the system's feasibility before its implementation by the MSMEs involved in Drinking Water Distribution [8]. By ensuring its reliability and suitability through testing, MSMEs can confidently embrace the system, leading to improved efficiency and effectiveness in their business operations.

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2. METHODS

The Systems Development Life Cycle (SDLC) encompasses various models, each addressing different stages such as requirements planning, user design, construction, and cutover. To overcome challenges associated with these stages and achieve faster results, the rapid application development (RAD) paradigm is employed. This approach is favored due to its ability to deliver high-quality outcomes in a shorter timeframe [9]. RAD adopts a focused approach by addressing one development requirement at a time, thereby reducing implementation time and complexity. The stages of RAD are well-structured, facilitating rapid software development through iterative cycles. Consequently, the program being developed can yield results without lengthy delays [10]. Figure 1 illustrates the implementation cycles and stages of the RAD method, showcasing its organized and efficient approach.

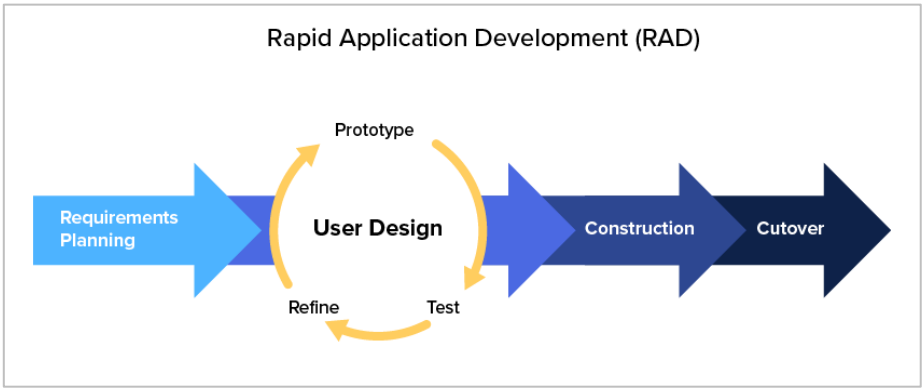

Figure 1. Rapid Application Development Model [9]

Figure 1 illustrates the sequential processes involved in implementing the RAD method, encompassing requirements planning, user design, construction, and cutover. A concise overview of each phase is provided below:

1) Phase 1 - Requirements Planning: During this stage, interviews are conducted to gather user information, plan the system design, and determine the features to be incorporated into the application. Discussions between users and analysts focus on identifying the system's objectives and finding solutions to address business challenges.
2) Phase 2 - User Design: This phase delves deeper into the requirements identified during the analysis stage. Each requirement is elaborated upon, and Unified Modeling Language (UML) diagrams, such as use case diagrams, are employed to depict the system's user interactions and define the primary functionalities to be developed [11].

3) Phase 3 - Construction: System development takes center stage in this phase. Continuous interaction among team members allows for feedback, adjustments, and improvements. Developers are responsible for coding, system development, and thorough testing of the system's functionality.
4) Phase 4 - Cutover: At the culmination of the RAD implementation process, the functional system undergoes testing using the black-box method, incorporating the Traceability Matrix model. This model traces all the requirements in matrix form, ensuring comprehensive coverage [12]. Following a comparison between the RAD approach and conventional methods, the organization can proceed with adopting the new system.

By following these well-defined phases, the RAD method facilitates a structured and efficient approach to system development, enabling organizations to deliver high-quality software solutions in a shorter timeframe.

3. RESULTS AND DISCUSSION

Upon establishing the chosen methodology for this study, the subsequent section delves into the outcomes and ensuing discussion, showcasing the utilization of the RAD method in the development of a Web-based Inventory and Sales Information System. The design progression commences with requirements planning, subsequently leading to User Design, Construction, and ultimately, Cutover, wherein the functionality of the successfully created system is tested.

3.1 Requirements Planning

The research initiates with the primary phase of the RAD method, which is Requirements Planning [13]. This crucial stage is undertaken to acquire an understanding of the user requirements pertaining to the challenges faced in the business processes of MSME Water Distribution Agents. Direct interviews with the Owner and Manager of the MSME are conducted to gather this pertinent information. Subsequently, the findings of these interviews unveil various identified problems, which are comprehensively outlined in Table 1.

Table 1. Problems Identification

No	Indicator	Problems Identification	Recommendation
1	Performance	Recording stock items and sales reports takes a lot of work because they are done using conventional paper and handwritten methods. The results of these records take time to read.	Transformation of the recording process from the conventional method into digital form using a computer so that the recording process can be input via the keyboard and speeds up the recording process. The results of recording in digital format are easier to read.

2	Information	There needs to be more information available about the total sales transactions per month, per week, and per day. So, it won't be accessible if the whole transaction information is needed to calculate sales profit.	Provides features for calculating monthly, weekly, and daily sales transactions through an information system so that they can provide the information needed by these MSMEs.
3	Economic	These MSMEs require regular costs to buy media books, paper, pens, and other office stationery for recording. The results of the recording accumulate, and cause wasted expenses.	Provide digital recording and archiving features through an information system so that stock records and sales reports are manageable and can be printed as needed. In addition, the report can be archived more organized.
4	Control	Searching for information on stock recording reports and sales reports written by hand on book media is more difficult to find when needed because the handwriting is constantly changing and tends to be difficult to read (usually only those who write can read the writing).	Searching for information is more accessible through an information system with a search feature based on the name of the stock item and the transaction date.
5	Efficiency	This MSME Drinking Water Distribution Agent requires particular time in the stock recapitulation, sales, and profits due to the conventional media.	Provides features to record transaction processes (stock, sales, profits) in an information system to make it more efficient and accessible faster than conventional processes.
6	Service	Calculating stock, sales, and other transaction processes takes time because it has to be calculated manually with the help of a calculator. In addition, in terms of service to customers in terms of billing, it is still done with manual receipts written by hand, which increases the risk of errors or manipulation.	It provides an automatic calculation feature to calculate logically and accurately on the recommended information system. Then for billing, customers can use the available print invoice feature.

Once the problem has been identified, the subsequent step entails conducting a thorough requirements analysis to ascertain the necessary functional requirements for the design of the information system [14]. The requirements analysis phase is crucial in defining the specific functionalities that the system needs to possess. The results of the requirements analysis are systematically presented in Table 2, providing a comprehensive overview of the identified functional requirements.

Table 2. Functional Requirements Analysis

Code	Requirements	Features
SRS-1	The system can be used to log into the system.	Users Login.
SRS-2	The system can create an inventory list.	Users create inventory data.
SRS-3	The system can see the inventory list.	Users view inventory data.
SRS-4	The system can change the inventory list.	Users edit inventory data.
SRS-5	The system can delete the inventory list.	**Users delete inventory data.

Code	Requirements	Features
SRS-6	The system can generate transaction data.	Users create transaction data.
SRS-7	The system can view transaction data.	Users view transaction data.
SRS-8	The system can change transaction data.	Users edit transaction data.
SRS-9	The system can delete transaction data.	**Users delete transaction data.
SRS-10	The system can generate financial reports.	Users create financial report.
SRS-11	The system can view financial reports.	Users view financial report.
SRS-12	The system can alter financial reports.	Users edit financial report.
SRS-13	The system can delete financial reports.	**Users delete financial report.

To ensure the prevention of manipulation or fraudulent activities by users other than system administrators, specific measures are implemented. In this regard, the highlighted requirements code, namely SRS-5, SRS-9, and SRS-13, are exclusively assigned for utilization by system administrator users (owners). By limiting access to these requirements, the system maintains a higher level of security and control, mitigating the risk of unauthorized actions.

3.2 User Design

The second stage of this study focuses on designing a comprehensive use case diagram to illustrate the primary functions accessible to users within the system [15]. The information system encompasses two distinct user roles: the System Administrator, who serves as the MSME Owner of the Water Distribution Agent [16], and the Operational Staff or Cashier. Within the use case diagram, the Operational Staff/Cashier user assumes responsibilities related to inventory and stock management, sales transactions, and transaction reporting. On the other hand, the System Administrator user possesses access to all the functions available to the operational staff user. However, due to their elevated role level, the system administrator role also includes managing user accounts, such as creating new users, modifying data, and deleting them. Moreover, this use case diagram will serve as a foundation for the system design during the third stage, which is the construction phase.

Figure 2 portrays a comprehensive use case diagram encompassing various essential activities within the system. These activities include user data management, inventory and stock data management, sales transaction data management, and transaction report data management. Each of these activities plays a vital role in facilitating the efficient operation and administration of the system, ensuring seamless user experiences and effective data management throughout the process. The use case diagram serves as a visual representation of

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the interconnections and interactions between these key activities, providing a clear overview of the system's functionality.

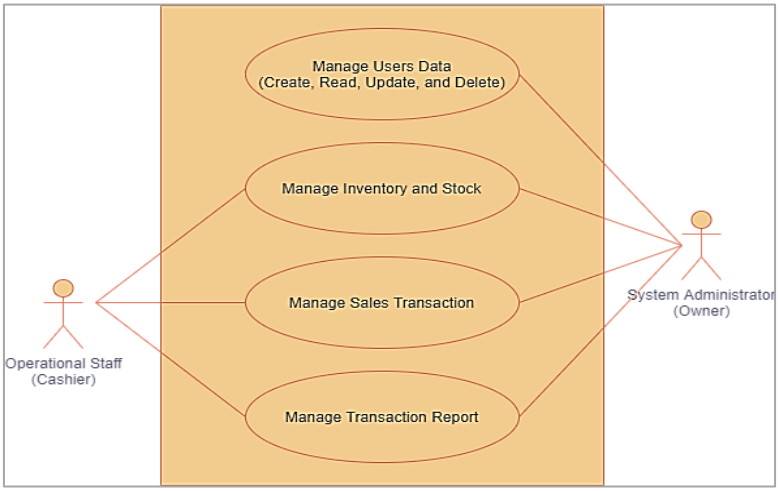

Figure 2. Use Case Diagram

Following the creation of the use case diagram, which illuminates the primary functions of the system as perceived by its users, the subsequent step entails deriving an activity diagram from the use case diagram. This activity diagram provides a more intricate and detailed depiction of the specific processes that unfold within the system. It serves as a valuable tool for visualizing the workflow and understanding the sequence of activities involved in various system operations. For instance, one prominent example is the activity diagram that illustrates the procedure for managing inventory and stock, particularly focusing on the addition of new items. By referring to Figure 3, stakeholders can gain a step-by-step representation of the inventory and stock management process, enabling a comprehensive comprehension of how these tasks are executed. Ultimately, the activity diagram contributes to enhancing the overall understanding of the system's workflow and plays a crucial role in identifying potential areas for optimization and improvement.

The activity diagram serves as a means to highlight the logical flow of activities and interactions within the system. By visualizing these processes, stakeholders can gain insights into the dependencies and relationships between different tasks, enabling a more effective analysis of the system's functionality. This, in turn, facilitates the identification of potential bottlenecks, inefficiencies, or areas that require further refinement. With a clearer understanding of the system's workflow, stakeholders can make informed decisions regarding system enhancements, process optimizations, or potential automation opportunities. In summary, the activity diagram acts as a valuable tool for system analysis, aiding in the

identification of improvements and optimizations while promoting a deeper understanding of the system's operational dynamics.

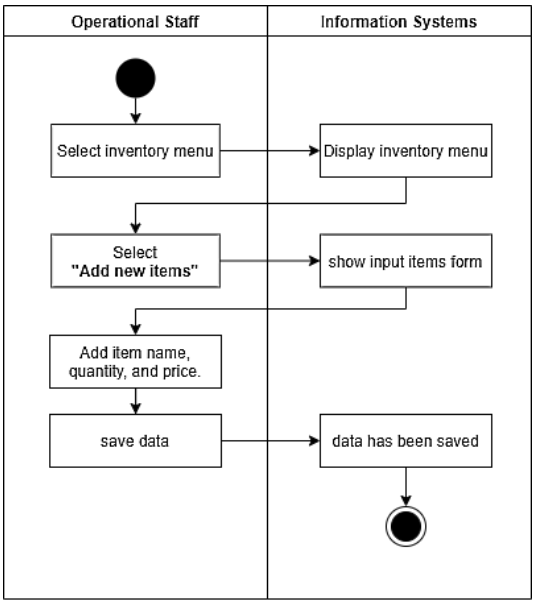

Figure 3. Activity Diagram

3.3 Construction

The login page presents users with an intuitive and user-friendly interface, featuring secure input fields where they can enter their username and password for authentication, as illustrated in Figure 4. Serving as the primary entry point, this page ensures that only authorized individuals can access the system, prioritizing the security and integrity of the system.

Moving to the inventory page, users are greeted with a comprehensive array of features and information. They are provided with a diverse selection of bottled water product brands, offering various packaging sizes to cater to different preferences. Additionally, users can access essential details such as the initial stock quantity, number of items sold, current stock quantity, as well as the purchase and selling prices for each item. Positioned conveniently at the bottom right of the page, users can effortlessly perform actions like adding new items, modifying existing ones, or removing items from the inventory. Figure 5 visually represents the inventory page, demonstrating its user-friendly and efficient interface for effective stock and inventory management.

Continuing to the transaction page, users gain access to a comprehensive overview of vital transaction details. This includes information such as the transaction code,

buyer's name, item name, purchase amount, total price, and purchase date. To enhance user convenience, the page incorporates a filtering feature located at the top right corner, enabling users to search and sort transactions based on specific dates. Similar to the inventory page, users have the flexibility to add new transactions, make modifications to existing ones, or delete transactions effortlessly using the options conveniently positioned at the bottom right. Figure 6 visually showcases the transaction page, highlighting its organized and user-friendly interface for efficient management of sales transactions.

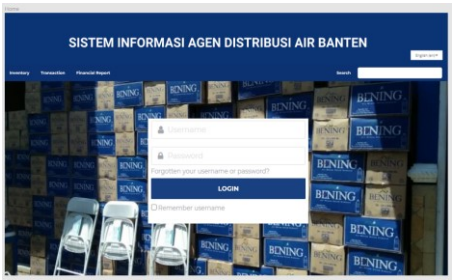

Figure 4. Login form – User Interface 1 (UI-1)

Figure 5. Inventory – User Interface 2 (UI-2)

Figure 6. Sales Transaction-User Interface 3 (UI-3)

Figure 7. Transaction Report-User Interface 4 (UI-4)

Finally, the Transaction Report page serves as a comprehensive summary of significant data encompassing dates, descriptions, debits, credits, and financial balances associated with MSME Water Distribution Agents. To streamline the process of retrieving specific information, users can utilize the date filtering feature situated at the top right corner of the page. Furthermore, users have the capability to add new transaction reports, make modifications to existing reports, or delete them as needed, utilizing the available options located at the bottom right. Figure 7 provides a visual representation of the Transaction Report page, offering an appealing and easily accessible interface for generating and managing transaction reports effectively.

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3.4 Cutover

During this stage, the system functionality undergoes thorough testing utilizing the Traceability Matrix, which assesses the alignment between user needs and the designed system features [16]. The testing process involves users of the information system, including the owners and cashiers of MSME Drinking Water Agents. The Traceability Matrix incorporates various aspects to track the results of requirements analysis, problem identification, and needs analysis, as documented in the use cases and user interface design [17][18]. Code displayed within the system's user interface facilitates the mapping between requirements and use cases, with abbreviations such as SRS (System Requirements), UC (Use Case), and UI (User Interface) utilized for clarity and simplicity.

For instance, in Table 3, the research objective requires the implementation of a login feature (SRS-1). In the User Design phase, this requirement is realized through the use of the UC-1 code, which is visually represented in UI-1. Table 3 showcases the evaluation results that have been conducted, providing insights into the system's performance and adherence to the specified requirements.

Table 3. Traceability Matrix

Code	Use Case Code	Use Case	UI Code
SRS-1	UC-1	Login	UI-1
SRS-2	UC-2	Manage Inventory and Stock	UI-2
SRS-3	UC-2	Manage Inventory and Stock	UI-2
SRS-4	UC-2	Manage Inventory and Stock	UI-2
SRS-5	UC-2	Manage Inventory and Stock	UI-2
SRS-6	UC-3	Manage Sales Transaction	UI-3
SRS-7	UC-3	Manage Sales Transaction	UI-3
SRS-8	UC-3	Manage Sales Transaction	UI-3
SRS-9	UC-3	Manage Sales Transaction	UI-3
SRS-10	UC-4	Manage Transaction Report	UI-4
SRS-11	UC-4	Manage Transaction Report	UI-4
SRS-12	UC-4	Manage Transaction Report	UI-4
SRS-13	UC-4	Manage Transaction Report	UI-4

It is essential to assess the efficacy of the system's functionality through rigorous testing, ensuring that it aligns with user needs and expectations. The Traceability Matrix serves as a valuable tool in this process, enabling a comprehensive evaluation of the system's performance and effectiveness. By mapping requirements to use cases and tracking the results through the user interface, the evaluation process provides valuable insights for further refinement and improvement of the system's design and functionality. The findings presented in Table 3 shed light on the outcomes of this evaluation, offering valuable information for decision-making and potential enhancements to the system.

Following the establishment of the traceability matrix mapping between SRS (System Requirements), UC (Use Case), and UI (User Interface), a crucial validation test was conducted. The objective of this test was to assess the validity and effectiveness of the success requirements of the developed information system. To gather insights and feedback, a set of fifteen questions was specifically designed and presented to the MSME owners and operational staff who actively participate in the business process.

This validation test aimed to evaluate the system's performance and its alignment with the identified requirements. The questions posed to the MSME owners and operational staff allowed for a comprehensive understanding of their perspectives and experiences regarding the information system. The responses collected from these stakeholders provided valuable insights into the system's usability, functionality, and overall satisfaction level.

Table 4 showcases the results derived from the validation test, presenting a detailed summary of the responses and indicating the extent to which the success requirements were met. The findings recorded in Table 4 serve as a crucial reference for further analysis, enabling the identification of areas that have excelled and areas that may require improvement. By incorporating feedback from the MSME owners and operational staff, the validation test contributes to the continuous enhancement and refinement of the information system, ensuring that it successfully addresses their needs and enhances their business processes.

Table 4. Traceability Matrix Validation

No	Questions	Valid	Description
1	Have the requirements been properly defined?	✓	Each requirement is precisely defined and has a letter and number code.
2	Are the use cases and user interfaces properly defined?	✓	Each use case and user interface are precisely defined using a combination of letters and numbers.
3	Can the SRS-1 be used to log in according to the design?	✓	Yes, it follows the design in the UC-1 and UI-1 codes, which have columns for

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No	Questions	Valid	Description
			the username, password, and login buttons.
4	Can SRS-2 make the inventory and stock lists?	✓	Yes, it follows the design in the UC-2, UI-1, and UI-2 codes, with an add button to add inventory data.
5	Can SRS-3 see inventory and stock lists?	✓	Yes, it follows the design in the UC-2, UI-1, and UI-2 codes, which contain a list of inventory data.
6	Can SRS-4 change inventory and stock lists?	✓	Yes, it follows the design in the UC-2, UI-1, and UI-2 codes, where there is an edit button to change inventory data.
7	Can SRS-5 delete inventory and stock lists? (Limited only for system administrator)	✓	Yes, it follows the design in the UC-2, UI-1, and UI-2 codes which have a delete button to delete inventory data.
8	Can SRS-6 generate sales transaction data?	✓	Yes, it follows the design in the UC-3, UI-4 code, which has an add button to add transaction data.
9	Can SRS-7 see sales transaction data?	✓	It follows the design in the UC-3, UI-4 code, which contains a list of transactions carried out.
10	Can SRS-8 change sales transaction data?	✓	Yes, it follows the UC-3, UI-4 code design, which has an edit button to change the transaction data.
11	Can SRS-9 delete sales transaction data? (Limited only for system administrator)	✓	Yes, it follows the design in the UC-3, UI-4 code, which has a delete button to delete transaction data.
12	Can the SRS-10 generate transaction reports?	✓	Yes, it follows the design in the UC-4, UI-5 code, which has an add button to add daily financial reports.
13	Can SRS-11 view transaction reports?	✓	Yes, it follows the design in the UC-4, UI-5 code, which contains a list of comprehensive reports.
14	Can SRS-12 change transaction reports?	✓	Yes, it follows the design in the UC-4, UI-5 code, which has an edit button to change if there is incorrect financial data.
15	Can SRS-13 delete transaction reports? (Limited only for system administrator)	✓	Yes, it follows the design in the UC-4, UI-5 code, which has a delete button to delete daily financial data.

The validation test conducted on the information system's success requirements, as presented in Table 4, aimed to assess the accuracy and effectiveness of the system's functionalities. The test consisted of fifteen questions, each evaluating specific aspects of the system's performance. The first two questions focused on

the proper definition of requirements, use cases, and user interfaces. Both questions confirmed that each requirement, use case, and user interface was precisely defined using a combination of letters and numbers.

The subsequent questions examined the system's login feature and its ability to create, view, modify, and delete inventory and stock lists. All these questions indicated that the system aligns with the specified designs and successfully implements the corresponding functionalities. The following questions assessed the system's capability to generate, view, modify, and delete sales transaction data. Once again, all these questions confirmed that the system adheres to the designated designs and effectively incorporates the required functionalities.

Finally, the questions evaluated the system's ability to generate, view, modify, and delete transaction reports. Similar to the previous functionalities, the system demonstrated its successful implementation of the intended designs and functionalities. Overall, the validation test results demonstrate that the information system meets the success requirements outlined in the traceability matrix. The system accurately defines and implements the specified functionalities, ensuring that users can effectively carry out their tasks related to inventory management, sales transactions, and generation of transaction reports.

3.5 Discussion

Efficiency is a critical factor in the success of MSMEs Drinking Water Agents, and the implementation of an information system plays a pivotal role in empowering efficiency within their operations. The validation test results, as discussed earlier, showcase how the information system enhances efficiency across various aspects of the business process. Accurate definition and implementation of the success requirements are fundamental in providing MSME owners and operational staff with a reliable and user-friendly platform. Precisely defining requirements, use cases, and user interfaces ensures a clear understanding of system functionalities, empowering users to execute their tasks efficiently and effectively. The login feature of the system ensures secure access, granting entry only to authorized individuals and bolstering overall security. This streamlined authentication process enables users to swiftly log in, saving valuable time and promoting efficiency from the moment they access the system.

The system's inventory management capabilities offer an array of features and information, facilitating efficient stock management. Users can effortlessly view, add, modify, and delete inventory and stock lists, empowering them to maintain accurate records of their available products. The user-friendly interface and intuitive design simplify the inventory management process, further enhancing efficiency throughout the organization.

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Efficient management of sales transactions is another key area supported by the information system. Users can generate, view, modify, and delete sales transaction data with ease. The system's ability to accurately track transaction details, such as the buyer's name, purchase amount, and total price, ensures transparency and enables efficient management of sales operations.

Moreover, the system's capability to generate and manage transaction reports contributes to overall process efficiency. Users can generate daily financial reports, access comprehensive transaction reports, and make necessary modifications when required. The system's streamlined approach to generating and managing transaction reports saves time and effort for MSME owners and operational staff, empowering them to focus on other critical aspects of their business.

The implementation of the information system empowers efficiency by providing MSMEs Drinking Water Agents with a robust platform to streamline their operations. The system's accurate definition and implementation of success requirements, coupled with its user-friendly interface, significantly contribute to enhanced efficiency in key areas such as inventory management, sales transactions, and the generation of transaction reports. By empowering efficiency, the system enables MSMEs to optimize their resources, improve productivity, and ultimately achieve their business goals with greater ease.

4. CONCLUSION

this study showcases the effectiveness of the Rapid Application Development (RAD) system design method in achieving efficient system design within limited timeframes and with small teams. The traceability matrix test results provide robust evidence that the designed information system is well-suited for utilization by MSME Agents of Drinking Water Distribution, meeting their specific needs. The successful implementation of the RAD system design approach emphasizes its potential in empowering efficiency for MSME Agents of Drinking Water Distribution. By embracing this methodology, organizations can leverage its benefits to quickly develop a customized information system that supports their day-to-day operations and requirements.

The comprehensive assessment carried out through the Traceability Matrix Validation, consisting of 15 questions, confirms the functionality of the information system. The validation process ensures that the system effectively addresses the company's specific needs, enabling MSME Agents of Drinking Water Distribution to optimize resources, streamline processes, and enhance overall operational efficiency. This research contributes to the practical application of the RAD system design method in the context of MSME Agents of Drinking Water Distribution. The findings emphasize the importance of adopting a systematic and efficient approach to system design, particularly when facing time

constraints and limited team capacity. The implementation of the RAD system design methodology has proven to be a suitable approach for developing an information system that empowers efficiency. The successful design and validation of the system demonstrate its alignment with the specific needs of MSME Agents of Drinking Water Distribution. By embracing this methodology, organizations can unlock the potential for enhanced productivity, streamlined operations, and the achievement of their business goals.

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REFERENCES

[1] Viska, "UMKM Go Online, Upaya Wujudkan Visi "Digital Energy of Asia," *kominfo.go.id*, 2017.
[2] E. F. Santika, "Jumlah UMKM di Indonesia Sepanjang 2022, Provinsi Mana Terbanyak?," *databoks*, 2023.
[3] H. Suyitno, "Kemenkop UKM targetkan 24 juta UMKM masuk ekosistem digital pada 2023," *Antaranews.com*, 2023.
[4] D. S. Fuadi, A. S. Akhyadi, and I. Saripah, "Systematic Review: Strategi Pemberdayaan Pelaku UMKM Menuju Ekonomi Digital Melalui Aksi Sosial," *Diklus J. Pendidik. Luar Sekol.*, vol. 5, no. 1, pp. 1–13, 2021, doi: 10.21831/diklus.v5i1.37122.
[5] F. Dewi and E. R. Mahendrawathi, "Business process maturity level of MSMEs in East Java, Indonesia," *Procedia Comput. Sci.*, vol. 161, pp. 1098–1105, 2019, doi: 10.1016/j.procs.2019.11.221.
[6] S. Chandra, R. Sutomo, and J. Wiratama, "Design And Development of Car Sparepart Sales Information System For Web-Based Using RAD Method On UMKM Sinar Seroja," *G-Tech J. Teknol. Terap.*, vol. 7, no. 2, pp. 494–503, Mar. 2023, doi: 10.33379/gtech.v7i2.2019.
[7] J. Wiratama and R. Ikana Desanti, "The Development of Web-based Sales Reporting Information Systems using Rapid Application Development Method," *Ultim. Infosys J. Ilmu Sist. Inf.*, vol. 13, no. 2, pp. 110–116, 2022.
[8] J. Wiratama, "Analysis and Design of Production Monitoring Information Systems on Label Shoe Manufacturing Companies," *Komputasi J. Ilm. Ilmu Komput. dan Mat.*, vol. 20, no. 1, pp. 12–23, 2022, doi:

10.33751/komputasi.v20i1.6075.
[9] A. Rahman, "Rapid Application Development Sistem Pembelajaran Daring Berbasis Android," *J. Intech*, vol. 1, no. 2, pp. 20–25, 2020.
[10] R. I. Desanti and A. E. Widjaja, "Aplikasi Perekrutan dan Penilaian Karyawan Berbasis Web pada PT. XYZ," *J. Ultim. InfoSys*, vol. 8, no. 2, pp. 74–80, 2018, doi: 10.31937/si.v8i2.616.
[11] D. Dennis, Alan, Wixom, Barbara, David, and Tegarden, "Systems Analysis and Design: An Object-Oriented Approach with UML, Sixth," *United States: Wiley*, 2020.
[12] H. P. Putro and A. F. Wibowo, "Software verification and validation on object oriented software development using traceability matrix," *Proc. 3rd Int. Conf. Informatics Comput. ICIC 2018*, pp. 1–5, 2018, doi: 10.1109/IAC.2018.8780518.
[13] T. Limbong, L. Sitorus, and O. Sitohang, "Pengembangan Model Rapid Application Development (RAD) dalam Aplikasi E-Voting Pemilihan Bakal Calon Rektor saat Masa Pandemi Covid 19," *MEANS (Media Inf. Anal. dan Sist.*, vol. 5, no. 2, pp. 126–131, 2020, doi: 10.54367/means.v5i2.970.
[14] B. Susilo, G. H. Kusuma, M. H. Fikri, and R. Saputri, "Kantor Lurah Kotabaru Reteh Dengan Metode Rapid Application Develovment (RAD)," *Jurnal Testing dan Implementasi Sistem Informasi*, vol. 1, no. 1, pp. 17–28, 2023.
[15] M. N. Arifin and D. Siahaan, "Structural and Semantic Similarity Measurement of UML Use Case Diagram," *Lontar Komput. J. Ilm. Teknol. Inf.*, vol. 11, no. 2, p. 88, 2020, doi: 10.24843/lkjiti.2020.v11.i02.p03.
[16] F. Amalia, M. Kurniawan, and D. T. Setiawan, "The Design of Traceability Information System of Smart Packaging-Based Product Supply Chain to Improve A Competitiveness of Apple Processed Agro-Industry," *J. Inf. Technol. Comput. Sci.*, vol. 5, no. 3, pp. 247–254, 2020, doi: 10.25126/jitecs.202053183.
[17] G. Duraisamy and R. Atan, "Requirement traceability matrix through documentation for SCRUM methodology," *J. Theor. Appl. Inf. Technol.*, vol. 52, no. 2, pp. 154–159, 2013.
[18] B. Suratno and J. Shafira, "Development of User Interface/User Experience using Design Thinking Approach for GMS Service Company," *J. Inf. Syst. Informatics*, vol. 4, no. 2, pp. 469–494, 2022, doi: 10.51519/journalisi.v4i2.344.