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Design and Implementation of a Web-Based Baby Product Sales and Recommendation System Using the SAW Method

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A B S T R A C T

Love Me Baby Shop is a shop in the field of marketing of baby goods sales. In marketing and selling its products, Love Me Baby Shop is still less than the maximum. This is because the products - Love Me Baby Shop products are still less known by the public. In order to increase marketing power and simplify the transaction process done then the author tries to design an information system application needed. Simple Additive Weighting (SAW) method is one of the methods used to solve a problem of fuzzy. Multiple Attribute Desicion Making (FMADM) is a Simple Additive Weighting (SAW) method, which is a method used to find the optimal alternative from a number of alternatives with criteria. The test results show that this application is able to display data products in the store love me baby shop. In addition, this application can also display recommendations for buyers. This study aims to design and build the application of Information Systems Sales via online and systematic ordering recommendations so that people, especially prospective buyers are not confused in choosing the necessary baby equipment.

1. INTRODUCTION

The rapid development of information technology has transformed various aspects of business activities, particularly in the areas of marketing, sales, and customer service. The widespread adoption of internet technology has enabled companies and retail businesses to utilize web-based information systems to improve operational efficiency, expand market reach, and enhance customer satisfaction [1]. As a result, many businesses have shifted from conventional sales methods to online platforms that provide faster access to information and more convenient transaction processes.

Electronic commerce (e-commerce) has become one of the most effective approaches for facilitating online transactions between sellers and customers. Through web-based systems, customers can access product information, compare available alternatives, and perform purchasing activities without geographical and time limitations [2]. In addition to supporting online transactions, modern e-commerce systems increasingly incorporate recommendation features to assist customers in selecting products that best match their needs and preferences.

Love Me Baby Shop is a retail store specializing in baby equipment and childcare products. Similar to many small and medium-sized businesses, the store faces challenges in promoting its products and reaching a broader customer base. Product information is still relatively limited, and customers often experience difficulties in identifying the most suitable baby products among the available alternatives. Consequently, an effective information system is required not only to support online sales activities but also to provide intelligent product recommendations that can assist customers

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in making purchasing decisions [3].

Decision Support Systems (DSS) have been widely implemented in various domains to assist users in selecting the most appropriate alternatives based on predefined criteria. One of the most commonly used methods in DSS is the Simple Additive Weighting (SAW) method. SAW is a multi-criteria decision-making technique that evaluates alternatives by calculating weighted scores for each criterion and determining the highest-ranking option [4]. The simplicity of implementation, computational efficiency, and ability to handle multiple decision criteria make SAW a suitable method for product recommendation systems.

Several previous studies have demonstrated the effectiveness of web-based sales systems in improving business performance and customer accessibility [5]. Likewise, recommendation systems based on decision-support methods have proven useful in helping users identify products that meet their specific requirements. However, the integration of online sales functionality and recommendation mechanisms for baby equipment products remains relatively limited, particularly for local retail businesses. Therefore, there is a need for a system that combines product sales management with recommendation capabilities to improve both customer experience and business competitiveness.

Based on these considerations, this study aims to design and develop a web-based sales information system integrated with a product recommendation module using the Simple Additive Weighting (SAW) method. The proposed system is expected to facilitate online sales transactions, improve product promotion, and assist customers in selecting suitable baby equipment products based on multiple evaluation criteria. Furthermore, the implementation of the SAW method is expected to provide systematic and objective recommendations, thereby supporting more effective purchasing decisions.

2. METHODS

This study employed a system development approach to design and implement a web-based sales information system integrated with a product recommendation module using the Simple Additive Weighting (SAW) method. The development process consisted of requirements analysis, system design, database design, implementation, and system testing. The proposed system was developed to facilitate online sales activities and provide product recommendations for customers of Love Me Baby Shop.

2.1. Data Collection

Data collection was conducted to obtain the information required for system development. Two techniques were employed during this stage:

2.1.1. Observation

Observation was conducted directly at Love Me Baby Shop to understand the existing sales process, product management procedures, and customer purchasing activities. This process also involved analyzing similar online sales systems available on the internet.

2.1.2. Interview

Interviews were conducted with relevant stakeholders to gather information regarding system requirements, operational procedures, product management processes, and customer needs.

2.1.3. Literature Study

Literature studies were carried out by reviewing books, scientific journals, articles, and previous research related to information systems, e-commerce, recommendation systems, and the Simple Additive Weighting (SAW) method.

2.2. System Requirements Analysis

The requirements analysis stage was conducted to identify the functional and non-functional requirements of the proposed system.

2.2.1. Functional Requirements

The developed system supports three categories of users:

- The owner is responsible for managing product information and monitoring sales activities through the system.
- The administrator manages the entire system, including user accounts, product data, recommendation processing, and transaction records.
- Customers can browse products, receive recommendations, and perform online purchasing transactions.

2.2.2. Non-Functional Requirements

The non-functional requirements include hardware and software specifications required to operate the system effectively.

Table 1. Non-Functional Requirements

Hardware Requirements	Software Requirements
Intel Core i3 Processor (2.4 GHz) 6 GB RAM 500 GB Hard Disk	Windows 10 Operating System XAMPP v3.2.2 Sublime Text 3 Microsoft Office 2013 Opera Browser

2.3. System Design

System design was performed using Unified Modeling Language (UML) and database modeling techniques to describe system functionality, user interactions, and data relationships.

2.3.1 Use Case Diagram

The Use Case Diagram was developed to identify interactions between users and the proposed system. Figure 1 illustrates the functional requirements and available services provided to owners, administrators, and customers.

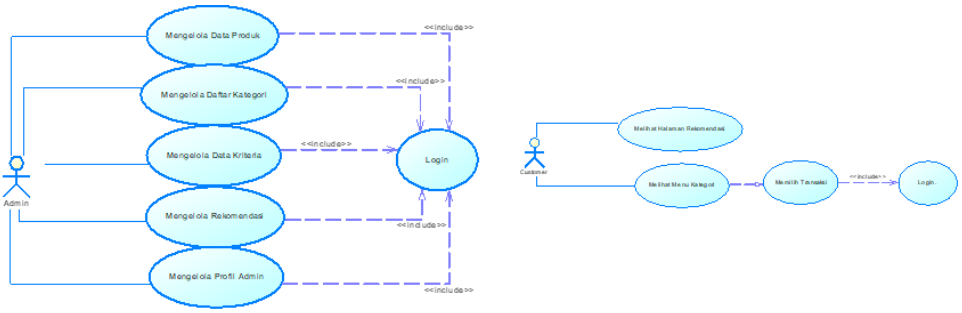

Figure 1. Use Case Diagram

As shown in Figure 1, the system enables administrators to manage products and transactions, while customers can browse products, obtain recommendations, and place orders online.

2.3.2 Conceptual Data Model

The Conceptual Data Model (CDM) was developed to define the logical relationships among entities within the system.

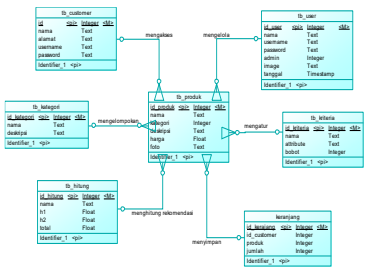

Figure 2. Conceptual Data Model

Figure 2 presents the conceptual structure of the database, illustrating the relationships among

users, products, transactions, recommendation data, and supporting entities.

2.3.3 Physical Data Model

The Physical Data Model (PDM) was designed to translate the conceptual design into a database structure that can be implemented in the system.

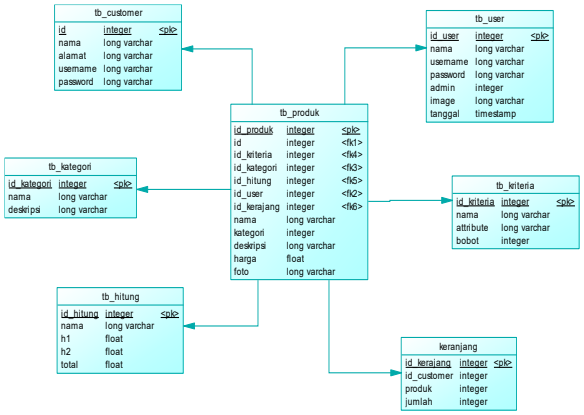

Figure 3. Physical Data Model

As illustrated in Figure 3, the physical database model defines the tables, attributes, and relationships required to support the operational functions of the proposed system.

2.3.4 Activity Diagram

Activity diagrams were developed to describe the workflow of system operations for different user roles.

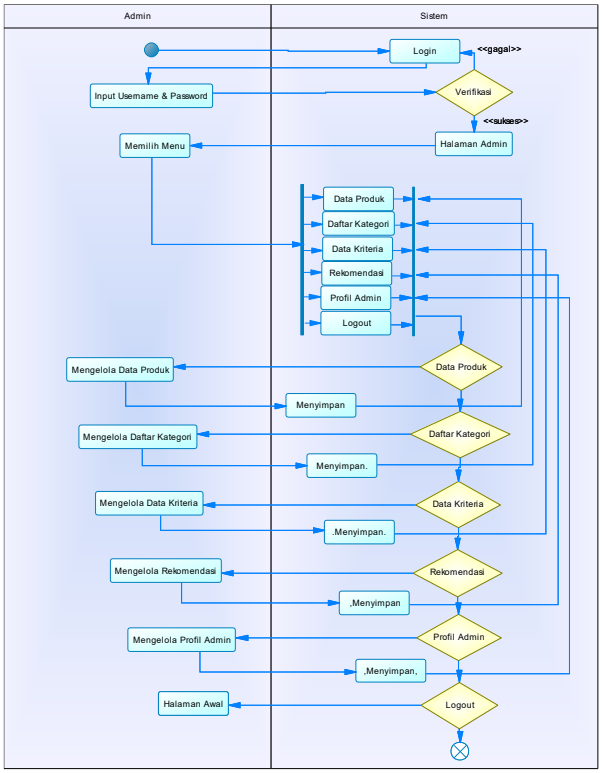

Figure 4. Activity Diagram for Administrator

Figure 4 illustrates the sequence of activities performed by administrators when managing product information, recommendation data, and transactions.

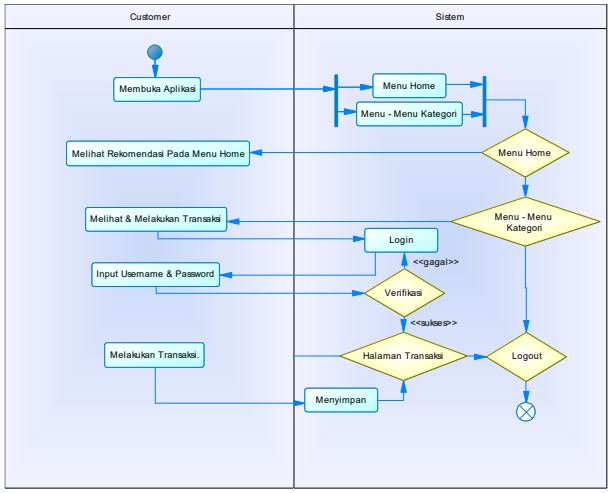

Figure 5. Activity Diagram for Customer

As shown in Figure 5, customers can browse products, view recommendations, and complete purchasing transactions through the web-based platform.

2.3.5 Sequence Diagram

Sequence diagrams were used to represent interactions between users and system components during execution.

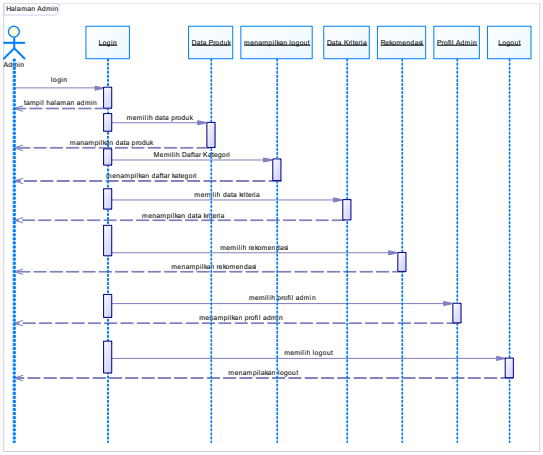

Figure 6. Sequence Diagram for Administrator

Figure 6 illustrates the communication process between the administrator and the system during product and transaction management activities.

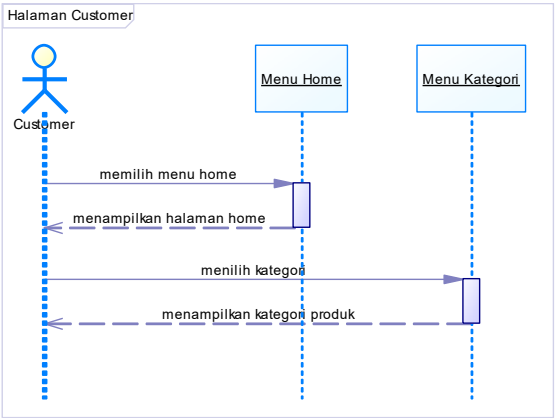

Figure 7. Sequence Diagram for Customer

As shown in Figure 7, customers interact with the system to access product information, obtain recommendations, and complete purchasing transactions.

2.4. Simple Additive Weighting (SAW) Method

The recommendation feature in the proposed system was developed using the Simple Additive Weighting (SAW) method. SAW is a decision-support technique used to determine the best alternative based on multiple evaluation criteria. The SAW process consists of the following steps:

- Determining recommendation criteria.
- Assigning weights to each criterion.
- Constructing the decision matrix.
- Normalizing the decision matrix.
- Calculating weighted preference values.
- Ranking alternatives based on the final scores.

The alternative with the highest preference value is selected as the most recommended product for customers.

2.5. System Implementation

The system was implemented as a web-based application using PHP and MySQL. XAMPP was utilized as the local web server environment, while Sublime Text 3 was used as the development platform. The implementation stage involved integrating the database, user interfaces, sales modules, recommendation modules, and transaction processing features.

2.6. System Testing

System testing was conducted to verify the functionality and performance of the developed application. Black Box Testing was employed to evaluate whether each feature operated according to the specified requirements. The testing process focused on validating input-output functionality, navigation processes, recommendation generation, and transaction management features.

3. RESULT

This section presents the implementation results of the web-based sales information system and product recommendation application developed for Love Me Baby Shop. The results include system interfaces, recommendation functionality based on the SAW method, transaction management, and system testing outcomes.

3.1. Login Page Implementation

The login page serves as the authentication interface for administrators before accessing the system. Through this page, administrators are required to enter a valid username and password to gain access to the management dashboard.

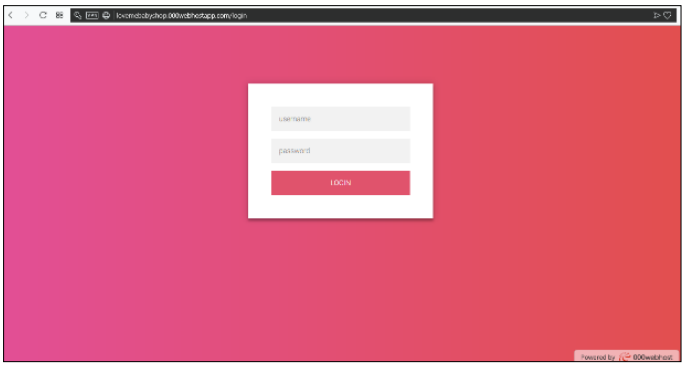

Figure 8. Login Page

Figure 8 presents the login interface of the proposed system. The authentication mechanism ensures that only authorized users can access administrative features and manage operational data within the application.

3.2. Administrator Dashboard

After successful authentication, administrators are redirected to the main dashboard page. This interface functions as the central management panel for all system activities.

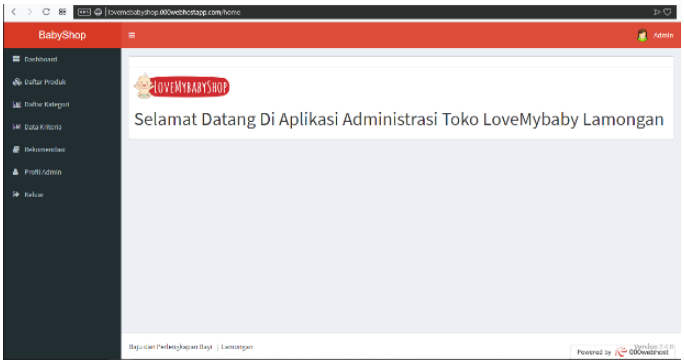

Figure 9. Administrator Dashboard

As shown in Figure 9, the dashboard provides access to various modules, including product management, recommendation processing, transaction monitoring, and customer data administration. The dashboard is designed to simplify system management and improve operational efficiency.

3.3. Product Management Module

The product management module enables administrators to manage product information stored within the system database.

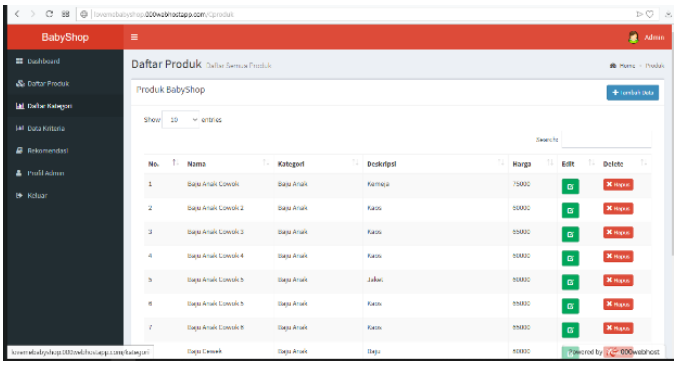

Figure 10. Product Management Page

Figure 10 illustrates the product management interface used to add, update, edit, and delete product records. Through this module, administrators can maintain accurate and up-to-date product information available to customers.

3.4. Product Recommendation Module

One of the primary features of the proposed system is the recommendation module developed using the Simple Additive Weighting (SAW) method.

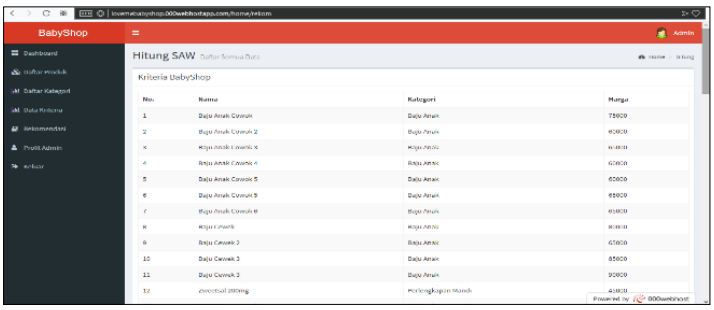

Figure 11. SAW Calculation Page

As illustrated in Figure 11, the recommendation process evaluates available products based on predefined criteria and calculates preference values using the SAW method. The resulting scores are used to rank available alternatives and identify the most suitable products for customers.

The implementation of the SAW method enables the system to provide objective recommendations and assist customers in selecting baby products according to their requirements

3.5. Customer Interface Implementation

The customer interface serves as the primary interaction medium between users and the system. Through this interface, customers can browse products, view recommendations, and perform purchasing transactions.

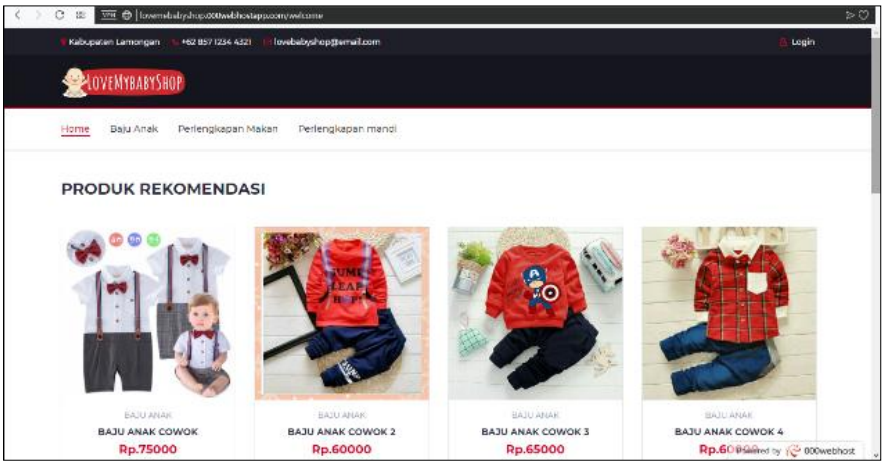

Figure 12. User Homepage

Figure 12 presents the main page displayed to customers. This page provides product information, navigation menus, and access to recommendation features available within the application

3.6. Recommendation Result Page

The recommendation page displays products that have been ranked using the SAW method.

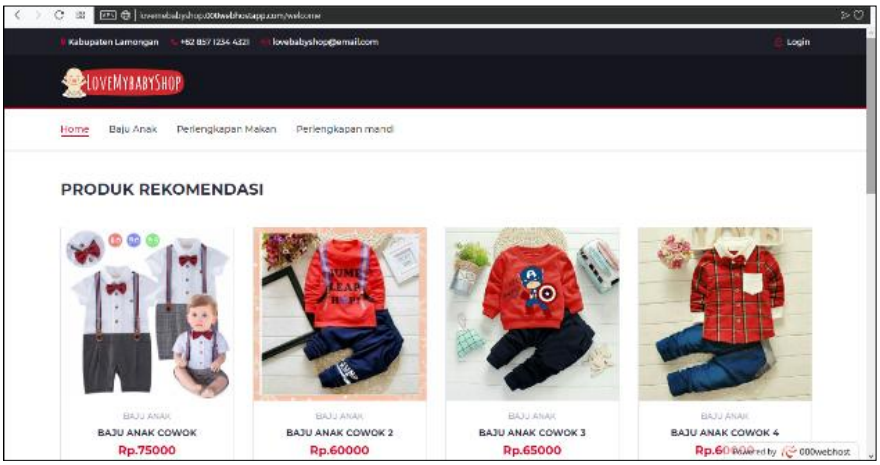

Figure 13. Recommendation Page

As shown in Figure 13, the recommendation module presents products according to their calculated preference values. This functionality helps customers identify suitable products more efficiently without manually comparing all available alternatives.

The recommendation feature is expected to improve customer decision-making and simplify the product selection process.

3.7. Transaction Module

The transaction module facilitates online purchasing activities conducted by customers.

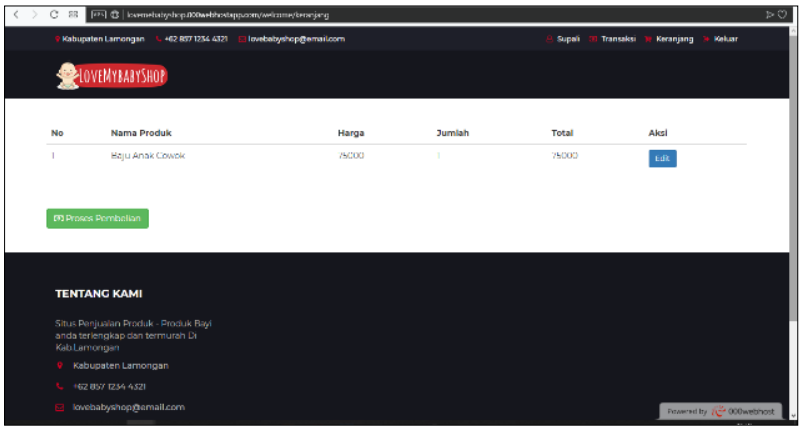

Figure 14. Transaction Page

Figure 14 illustrates the transaction interface used to process product purchases. Through this page, customers can review selected products, submit transaction information, and complete the purchasing process.

The implementation of this module enables the system to support end-to-end sales activities, from product selection to transaction processing.

4. DISCUSSION

The primary objective of this study was to develop a web-based sales information system integrated with a product recommendation feature using the Simple Additive Weighting (SAW) method. Based on the implementation and testing results, the proposed system successfully fulfilled its intended functions by providing an online platform that supports product management, recommendation generation, and transaction processing for Love Me Baby Shop.

The implementation results demonstrate that the developed system provides a centralized platform for managing sales activities. As shown in Figure 9, the administrator dashboard enables efficient management of products, recommendations, and transaction records. The integration of these modules into a single system reduces manual administrative tasks and improves operational efficiency. Furthermore, the product management module illustrated in Figure 10 allows administrators to maintain accurate and updated product information, which is essential for ensuring that customers receive reliable product descriptions and recommendations.

One of the most significant contributions of the proposed system is the implementation of the Simple Additive Weighting (SAW) method for product recommendations. The recommendation process, presented in Figure 11, evaluates available products based on predefined criteria and generates preference scores for each alternative. The use of SAW enables the recommendation process to be performed systematically and objectively because each product is evaluated according to the same criteria and weighting scheme. As a result, customers can receive recommendations that are more structured and relevant than conventional manual product selection methods.

The recommendation feature also addresses one of the challenges identified during the preliminary analysis, namely customer difficulty in selecting suitable baby products from numerous available alternatives. Figure 13 illustrates the recommendation page generated by the system. By presenting ranked alternatives, the application assists customers in identifying products that best satisfy their needs without requiring extensive manual comparison. This functionality improves the overall customer experience and supports more informed purchasing decisions.

From the business perspective, the implementation of a web-based sales platform offers significant advantages for Love Me Baby Shop. The customer interface shown in Figure 12 enables users to access product information regardless of time and location, thereby expanding market reach beyond traditional in-store transactions. In addition, the transaction module illustrated in Figure 14

facilitates online purchasing activities and simplifies communication between customers and the store. These capabilities contribute to increased accessibility and potentially improve sales performance.

The Black Box Testing results further confirm the reliability of the developed system. As summarized in Table 1, all tested functionalities operated according to their intended specifications. The successful execution of authentication processes, product management features, recommendation calculations, and transaction processing indicates that the system is capable of supporting operational activities without significant functional issues. The testing outcomes demonstrate that the system meets the established functional requirements and is suitable for practical implementation.

The findings of this study are consistent with previous research indicating that web-based information systems can improve business operations and customer service quality. Moreover, the integration of decision-support methods such as SAW provides additional value by assisting users in evaluating alternatives based on multiple criteria. This combination of e-commerce functionality and recommendation capability creates a more comprehensive solution than conventional online sales systems that merely display product information.

Despite the successful implementation, several limitations remain. The recommendation mechanism depends on predefined criteria and weighting values determined during system development. Different customers may have varying preferences that are not fully represented by the existing recommendation model. Additionally, the current system focuses primarily on product recommendations and sales transactions. Future research may incorporate more advanced recommendation techniques, such as collaborative filtering, content-based filtering, or hybrid recommendation approaches, to improve recommendation accuracy and personalization.

Overall, the results demonstrate that the proposed system successfully integrates sales management and product recommendation functionalities within a web-based environment. The implementation of the SAW method contributes to a more systematic product selection process, while the web-based architecture enhances accessibility and operational efficiency for both customers and business owners.

5. CONCLUSION

This study successfully designed and implemented a web-based sales information system integrated with a product recommendation feature using the Simple Additive Weighting (SAW) method for Love Me Baby Shop. The developed system provides facilities for product management, recommendation generation, and online transaction processing within a single platform. The implementation of the system enables customers to access product information, obtain recommendations, and perform purchasing activities more efficiently through a web-based environment.

The results of system implementation and testing indicate that all developed functionalities operated according to the specified requirements. The application successfully manages product data, generates recommendations based on multiple evaluation criteria, and supports transaction processing activities. The integration of the SAW method allows the system to provide objective and systematic product recommendations, thereby assisting customers in selecting suitable baby products from the available alternatives.

From a business perspective, the proposed system contributes to improving product promotion, expanding customer accessibility, and enhancing the overall sales process. The web-based architecture enables customers to access services regardless of time and location, while the recommendation feature improves decision-making during product selection. Therefore, the developed system can serve as an effective solution for supporting sales and recommendation activities at Love Me Baby Shop.

Future development may focus on enhancing the recommendation mechanism through the implementation of more advanced decision-support or recommendation techniques, integrating online payment gateways, and improving system security and user experience to provide a more comprehensive e-commerce platform.

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