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Design of a Website-Based Goods Inventory Information System at the Grocery Store

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ABSTRACT

This research aims to design and build a website-based inventory information system at the Dewi Grocery Store. The problem currently faced by stores is that capturing and managing inventory data is still manual, causing problems such as difficulty monitoring stock, recording errors and making old reports. The research method used is Agile Methods, consisting of requirements, design, implementation, verification and maintenance. System design using Laravel, Visual Studio Code, MySQL, XAMPP, Draw.io, and Whimsical. The research result is a website-based inventory information system application that can help the Dewi Grocery Store manage inventory data effectively and efficiently. The sales inventory system is functional and user-friendly, making it a valuable tool for Dewi Grocery Store to effectively manage sales inventory and provide accurate reports. The application has category management features, item data, sales, and report creation, as well as prediction features to help shop owners make decisions. The results of black box, expert, and user testing show the application is worthy of use with scores of 94%, 76%, and 83 %, respectively.

1. Introduction

Rapid technological developments have increased the use of computers in various sectors, including the economy, where computer-based information systems provide more value than manual systems [1]. This can be seen in various companies, including small businesses such as the Dewi Grocery Store in Banggle Village, Blitar, which face challenges in manual stock management. The Dewi Grocery Store, which has been operating since 2010, still manages inventory manually, thus encountering various difficulties such as inaccurate sales and inventory recording, difficult planning, and non-automatic data integration.

Manual systems also make data processing and report creation complex and time-consuming. Designing and implementing a stock information system at Richard Mandala Jambi Minimarket. Currently, inventory control is traditionally carried out manually by recording information on incoming and outgoing goods. This method has several obstacles, such as the length of the data recording process, the difficulty of obtaining accurate information on the availability of goods, and the difference between the recorded inventory and the actual inventory [2]. By utilizing a web-based inventory information system, Dewi Grocery Store can manage stock more efficiently and effectively [3]. This system allows for better stock monitoring, sales tracking and inventory planning. In addition, automatic data integration with other departments will reduce human error and increase the accuracy of stock information. Web-based inventory information systems are capable of automatically integrating data with other departments, such as those handling purchasing, sales, and warehouses. Thus, information about the stock of goods will be more accurate, and there will be less human error in data management. After the store implements a web-based inventory information system, it is expected that the operation will be more efficient, the inventory management of goods will be more efficient, and customer satisfaction will be higher. In addition, the use of information technology is also able to help the Dewi

Grocery Store company compete with other grocery stores that have adopted a more up-to-date inventory information system.

The implementation of a web-based inventory information system is expected to increase operational efficiency, inventory management and customer satisfaction. This technology also helps Dewi Grocery Store compete with other stores that already use more sophisticated information systems. Web-based information systems, which can be accessed via the internet, are capable of collecting, processing, storing and presenting information in various formats. This allows easy updating and access of store-related information by customers [4]. If the seller has good quality, then the number of buyers will increase Azzahra [5]. The stock of goods can affect the quality of the store, especially if the amount of inventory does not match consumer demand.

System design methods that use web technology allow the system to operate on various devices connected to the internet. The author uses the exponential smoothing method with an alpha of 0.1 and a calculation period of 3 months to design a prediction system for inventory at the Dewi Basic Food Store. This method has the advantage of its ability to give greater weight to the latest data, so that the inventory system can adjust predictions to changes in demand patterns dynamically. This is especially important in the grocery industry, where fluctuations in demand often occur due to seasonal factors or consumer trends. In addition, this method also has complex regressions or artificial intelligence-based models. This simplicity allows for more efficient implementation in web-based systems, without requiring high computing power. This method is expected to help stores predict stock quickly and efficiently, adjust inventory to customer demand, and avoid losses due to excess stock [6]. The purpose of this study is to design and implement an information system based on the *Web*, which will be used to manage sales and inventory [7]. Currently, stores are still managing sales and inventory manually, which is time-consuming and may not be accurate. To develop a web-based warehouse management information system with *a prototype* method, focusing on the case study of Toko Abadimas. This research was conducted to overcome the problem of inventory management, which is still done manually in stores [8].

2. Methods

The R&D method is an approach used to develop or improve products, services, or processes [9]. In this context, products produced through an R&D approach include software, such as the inventory information system for the Dewi Grocery Store. The R&D approach is not only limited to developing hardware, such as books or modules, but also includes computer programs designed to process data and improve operational efficiency. Through this approach, the research aims to create an information system design that is able to meet the specific needs of the Dewi Grocery Store, improve inventory management, and minimize errors and the time required for data processing.

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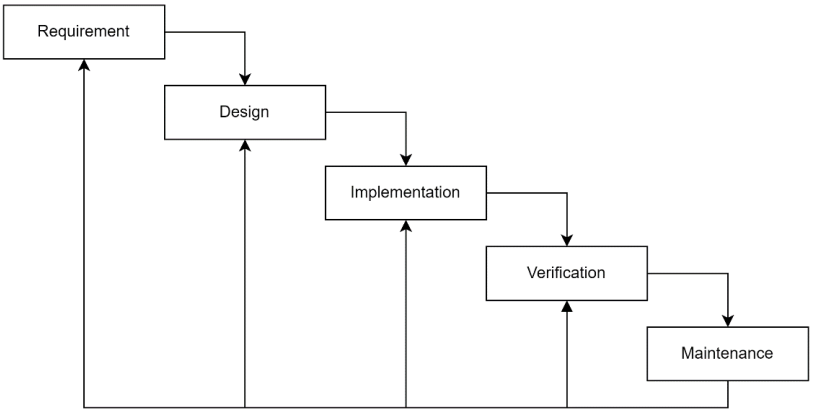

Figure 1. Waterfall Method

Implementing an online inventory information system at Throve Store Soppeng. The research method used is qualitative research with observation data collection techniques, interviews and literature research. This research also uses the SDLC (*System Development Life Cycle)* system development method [10]. The use of the Waterfall method in developing information systems is part of the System Development Life Cycle (SDLC), which is known as the classic life cycle. This method is structured and systematic, where each stage must be completed sequentially before proceeding to the next stage [11]. Each stage in the Waterfall method has unique characteristics and requires full attention to the task being performed. This stage includes requirements analysis, design, programming, testing, and maintenance. In this approach, parallel work is rare because the main focus is to complete each task sequentially to ensure the quality and completeness of each stage [12].

The use of the Waterfall method (Figure 1) in this research provides an organized framework for creating software, ensuring that each step is carried out carefully and thoroughly. Thus, this method supports structured, systematic, and sequential software development, which is essential for the successful implementation of the proposed information system.

In the context of inventory of goods, the system must have a solid data structure and a well-defined workflow. Waterfall ensures that each stage is thoroughly developed before moving on to the next, reducing the risk of major changes in the middle of the process. This is in contrast to Agile, which is more flexible but can lead to frequent changes, which may not be ideal for inventory systems that require stability. In addition, the Waterfall method is easier to implement in teams with already separate roles, such as systems analysts, designers, and developers. Robust documentation in each stage also aids in long-term maintenance, ensuring the system remains usable and updated efficiently. With this approach, the inventory system can be developed in a more structured manner and with minimal risk of unexpected changes.

The process of analyzing user needs is based on information from direct interviews and surveys. The results of this analysis will be used to determine the features, objectives and specifications of the software system to be developed. The following are some system requirements that are important for developing this application:

i. Hardware : Lenovo Ideapad Laptops,4 GB RAM, Intel® Core™ i5-6200, Operating System, Windows 10 Home Single Language.
ii. Software : Mysql, Visual Studio Code, Google Chrome, XAMPP.

In the waterfall method, the testing approach is structured and sequential, aligning with the project phases. It begins with Requirements Analysis, where testers identify testable conditions from the requirements and create initial test plans. During the System Design phase, test cases are designed based on system design documents, and test environments are defined. The Implementation phase involves finalizing test cases and setting up testing environments, but no actual testing is conducted yet. Testing

occurs in the Integration and Testing phase, where, after coding, testers perform unit, integration, and system testing, logging any defects for developers to address. Following successful testing, the product is deployed in the Deployment phase, often accompanied by acceptance testing to ensure it meets stakeholder requirements. Finally, during the Maintenance phase, regression testing may continue to verify that updates do not introduce new issues.

3. Results and Discussions

a. Dewi Grocery Store Goods Inventory Information System Design

Based on the findings, researchers designed an inventory information system to calculate inventory predictions at the Dewi Grocery Store using the exponential smoothing method with an alpha of 0.1 and a 3-month period. Currently, inventory management is still carried out manually with *a paper-based method*, which often causes problems such as inconsistencies in the amount of inventory, documents that are not organized, and inventory accounting processes that take a long time. With the existence of an online warehouse information system, it is hoped that it can increase the efficiency of warehouse management and obtain warehouse information more efficient and easier [13]. This design is expected to help stores predict the next month's stock efficiently and quickly, avoiding losses due to excess stock.

The use of algorithms is very important in processing data in computer systems. Algorithms are logical representations created by software developers to improve system functionality, in contrast to logarithms which are mathematical operations.

b. Application Design

The application is designed based on user needs, using UML diagrams, namely use case diagrams, activity diagrams, and entity relationship diagrams (ERD).

i. Use Case Diagram: Illustrate the interaction between the system and actors, as well as the functions in the system.
ii. Activity Diagram: Describes actors, actions, and the time sequence of actions.
iii. Entity Relationship Diagram (ERD): A data modeling tool that visually describes the data structure in a database system, identifying entities, attributes, and relationships between entities.

ERD assists in the database design process, facilitating design, implementation, and maintenance. ERD is also used to document database structure, understand data flow, and analyze the impact of changes. With ERD, database designers ensure the database meets user needs and works effectively.

c. Application Design and Build Results

The use of the Waterfall method in the development of an inventory information system facilitates the design and implementation process of the system. This method consists of systematic stages: requirements, design, implementation, verification, and maintenance.

The application that has been designed is a web-based application that can be accessed via the internet network, allowing users to use the application from wherever they are in a fast and easy way through access to the website. The following is an overview of the appearance of the application that has been designed.

i. Admin Login Page

The admin login displayed is the main interface of the store management app, which is designed to provide secure and efficient access to the store owner or manager. Through this interface, users who have admin credentials can log in to the system to manage various aspects of the store's operations, such as inventory of goods, sales transactions, and financial statements. Security is an important element in this login design.

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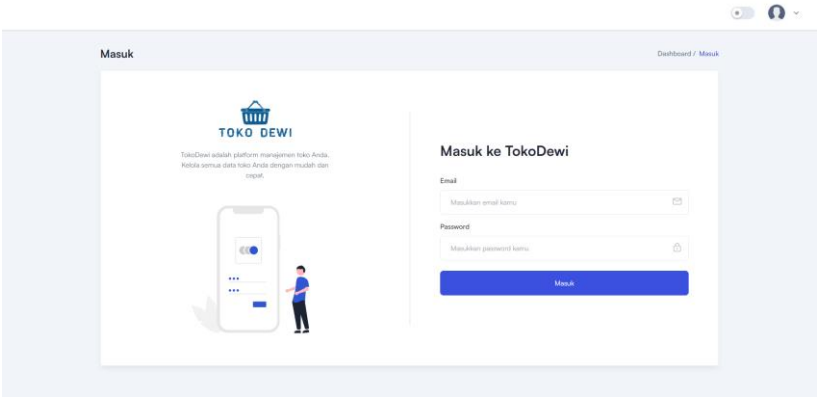

Figure 2. Admin Login Page

Figure 2 shows the admin login page with a username and password-based authentication mechanism; The system ensures that only authorized users can access store information. Additionally, features such as data encryption and an account recovery system increase protection against unauthorized access.

The Admin Login page shown in the image above is the interface for a shop management application called Toko Dewi. Users can enter their email and password on this page to log in to the application. After successfully logging in, users can access the application's various features and tools, such as managing goods data and sales, creating reports and predictions, and others.

ii. Dashboard Page

The dashboard page on the Toko Dewi app serves as an information center for store owners, providing a comprehensive overview of sales profits and business conditions in real-time. With an intuitive interface, this dashboard presents data in the form of graphs, tables, and key indicators that make it easier for business owners to analyze sales trends. One of the key features available is a daily, weekly, and monthly profit recap, allowing store owners to see revenue patterns as well as identify best-selling products. In addition, the system also presents a profit ratio, comparing revenue to operating costs, so that owners can assess the efficiency of their business.

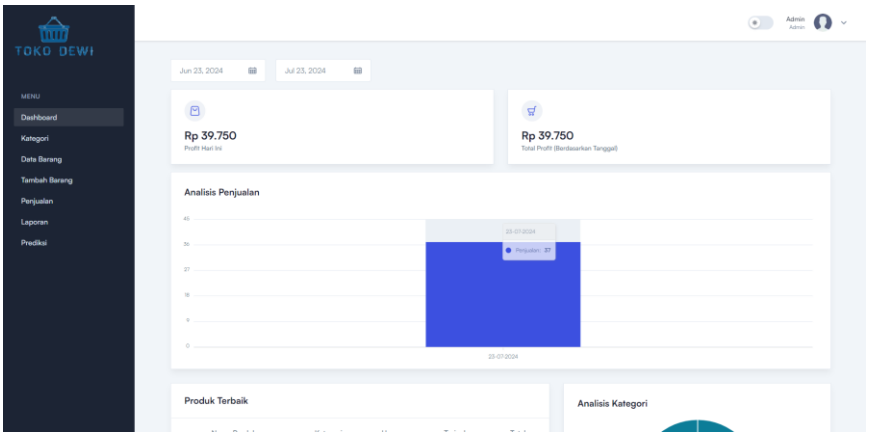

Figure 3. Dashboard Page

Figure 3 shows the starting page after the admin successfully logs in from the login page. The dashboard also comes with customer trend analysis, which provides insights into buyer preferences, the highest transaction times, and the potential for marketing strategy development. With the data obtained, store owners can make data-driven decisions to increase sales and design more targeted promotions. The integration of technology in the Toko Dewi application makes business management more effective,

reduces reliance on manual record-keeping, and ensures that every decision-making step is supported by accurate and up-to-date data.

The dashboard page on the Toko Dewi application provides information and analysis of sales profits for shop owners. The main section in the middle of the page displays various business information, such as today's profit, total profit, sales analysis, best products, and category analysis.

iii. Category Page

The Categories page on the Toko Dewi application is designed to help users manage the different types of products sold in the store. With this feature, owners or admins can easily create, edit, and delete product categories according to their business needs.

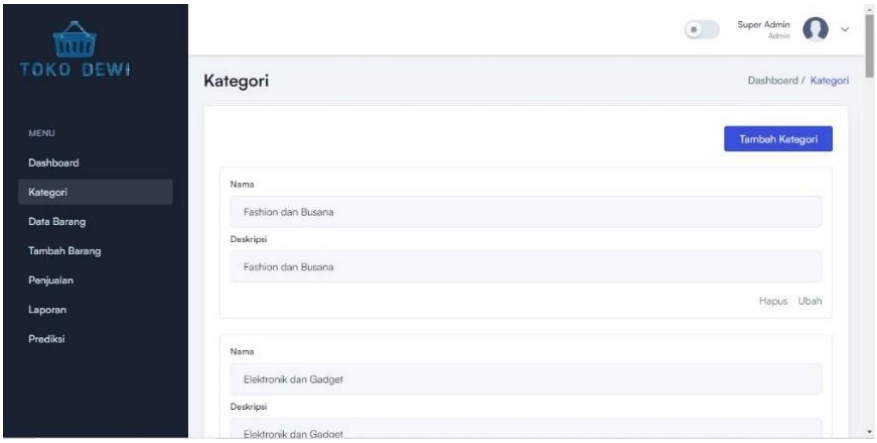

Figure 4. Category Page

Figure 4 shows the categories of the inventory of goods. Each category serves as a container that makes it easy to organize items, so customers can quickly find the products they are looking for based on their type, such as fresh food, beverages, kitchen ingredients, or household products. This clear structure improves the user experience and speeds up the process of searching for items in the system.

The Category page on the Toko Dewi application allows users to manage product categories for sale. There are two categories that have been added previously, namely "Fashion and Clothing" and "Electronics and Gadgets". Users can view detailed category information, such as name and description. The “Add Category” button allows users to add new categories to the system.

iv. Item Data Page

The Goods Data page in the Toko Dewi app serves as the main interface for managing product information thoroughly. With this feature, store owners or admins can perform various important actions, such as adding, editing, and deleting item data easily.

Each product listed in the system has complete details, including the name of the item, category, price, available stock, and description. This information is organized in an intuitive view, allowing store owners to quickly access and update data. In addition, the system comes with search and filter features, so users can find specific products by category or price in seconds.

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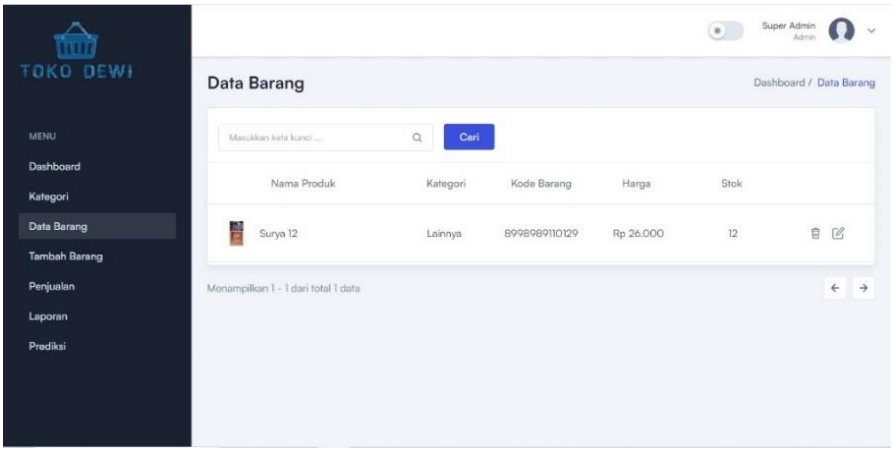

Figure 5. Item Data Page

Figure 5 shows that the item data page on the Toko Dewi application provides an interface for managing product information comprehensively. There is a table that displays product details such as name, category, item code, price and stock. Users can also easily search for products via the search column above the table. This feature helps shop owners to monitor and manage product information, from checking stock, adjusting prices, to tracking item codes.

v. Add Item Page

The Add Items page on the Toko Dewi app provides an intuitive interface to quickly and efficiently enter new products into the system. This feature allows store owners or admins to manage inventory in a more structured way, ensuring that every product that comes in is recorded accurately.

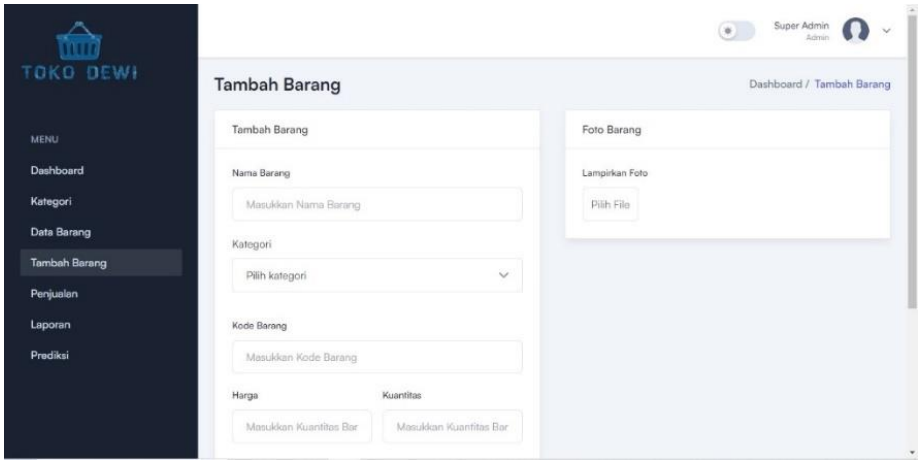

Figure 6. Add Item Page

Figure 6 shows the items to be added in the availability of goods. When users access this page, they can fill in various important information about the product, such as the name of the item, category, price, stock quantity, and description. In addition, the system supports the upload of product images, providing a visual display that assists customers in recognizing the available items.

The main advantage of this interface is its ease of use, where any data can be instantly stored and connected to the inventory system. Stock changes are automatically updated after items are added, ensuring that the information recorded is always accurate without the need for manual record-keeping.

The add goods page on the Toko Dewi application provides an interface for adding new products to the system. Users can fill in product information such as name, category, item code, price, quantity, description, and upload product photos. After filling in all the information, users can save new product data easily.

vi. Sales Page

The Sales page on the Toko Dewi application functions as a center for managing product transactions, ensuring that the purchase process takes place efficiently and accurately. This interface is designed to provide convenience for owners or cashiers in recording every transaction, both in cash and digitally.

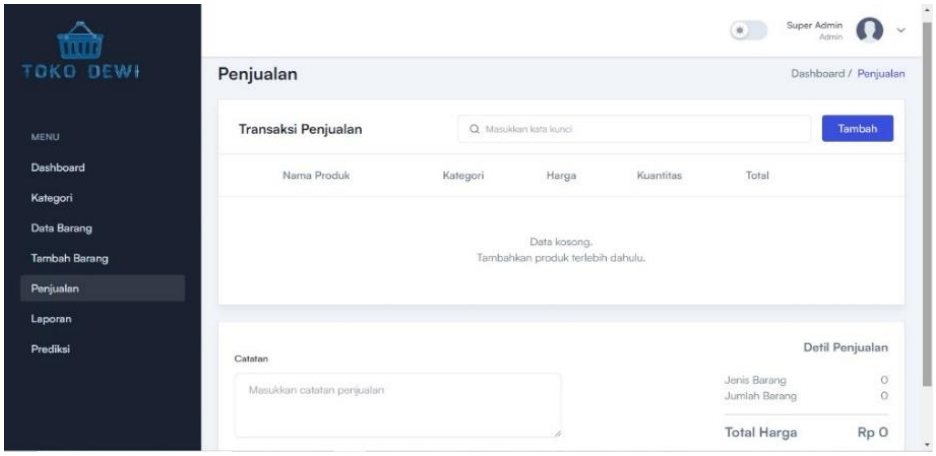

Figure 7. Sales Page

In figure 7, users can quickly select the products sold, determine the number of purchases, and automatically calculate the total price. The system also supports discounts and taxes, so transactions can be adjusted to store policies. Additionally, the QR code or barcode scanning feature allows for faster recording of goods and reduces manual input errors.

The sales page on the Toko Dewi application provides an interface for managing product sales transactions. There is a table that displays details of sales transactions, and users can search for specific transactions via the search column at the top of the table. At the bottom of the page, there is brief information regarding the number of types of goods sold and the total transaction price. These features make it easier for store owners to track, analyze and gain a comprehensive overview of sales activities.

vii. Reports Page

The Reports page in the Toko Dewi app provides a comprehensive interface for store owners to view and analyze the history of sales transactions. With this feature, users can monitor business performance based on systematically organized data.

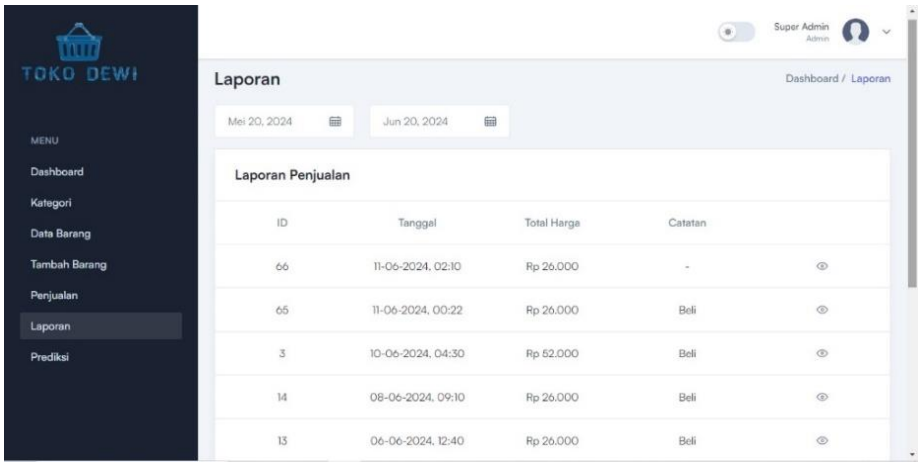

Figure 8. Reports Page

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Figure 8 shows the report data on the date and total price of the goods that have been sold. One of the main advantages of this page is its ability to present a recap of daily, weekly, and monthly transactions, giving store owners in-depth insights into sales trends. The data is displayed in the form of interactive tables and graphs, allowing for quick analysis of customer buying patterns as well as the identification of best-selling products.

The report page on the Toko Dewi application provides an interface for viewing and analyzing sales transaction history. There is a table that displays detailed information about transactions such as ID, date, total price, and notes. Users can select a specific date range to monitor sales performance in the relevant time period. Each row in the table displays the details of one sales transaction, allowing store owners to comprehensively explore sales history.

viii. Predictions Page

Using forecasting methods such as exponential smoothing or historical trend analysis, the system predicts the amount of stock required for the upcoming period. This data is displayed in the form of easy-to-understand graphs and tables, allowing store owners to see patterns of demand that evolve over time.

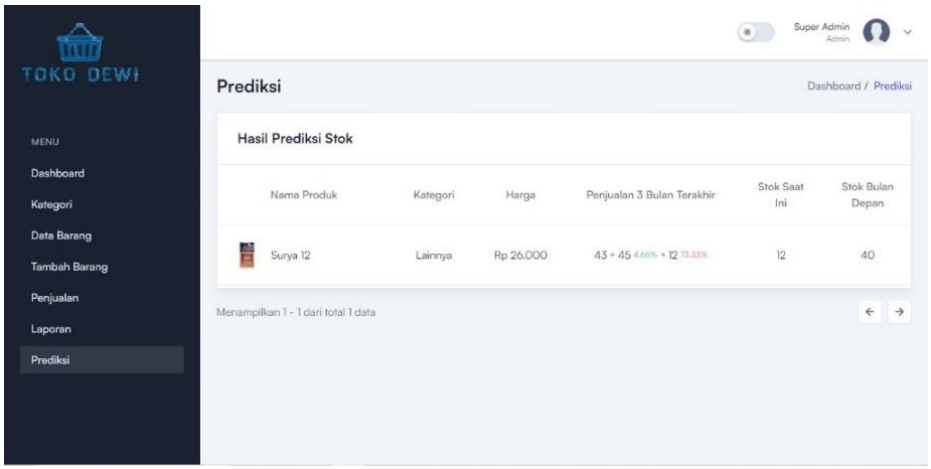

Figure 9. Predictions Page

Figure 9 shows about the prediction page in the system is designed to provide information on the results of product stock analysis based on sales trends over the past three months. This feature allows store owners to prepare inventory management strategies more accurately, avoiding excess or understock that can affect business operations.

The prediction page on the Toko Dewi system provides information regarding product stock prediction results for the last 3 months. The table displayed shows product details, including product name, category, price, last 3 months sales, current stock, and next month's stock. By knowing future sales and stock estimates, shop owners can procure goods better, thereby minimizing the risk of shortages or excess stock.

d. Blackbox Testing Results

Blackbox Testing is one of the alternative tests to complement *white box testing*, where testing only focuses on defining functional requirements, whose purpose is to find out and verify whether the function, input and output of the application are functional. It is based on the original technical data of the corresponding application. Blackbox testing is easy to implement because it focuses on the functional side specifications of the app and is not interested in the design of the app [14].Equation (1) computes the percentage of successful testing.

Table 1. Blackbox Testing

Class	Scenario	Expected results	Status
Log in correctly	Email and password are correct	Enter the system, login is successful	Succeed
Login incorrectly	Incorrect email and password	Shows error, login failed	Succeed
Category type input is correct	Added missing name and description	Successfully added a new category	Succeed
Incorrect category type input	Adds an existing name and description	Shows error, item already exists	Fail
Delete category type	Delete a category	Successfully deleted category	Succeed
Edit category type	Edit and change categories	Successfully edited and changed categories	Succeed
Search for item data	Enter item keywords	Successfully displays item data	Succeed
Delete item data	Delete item data	Successfully deleted item data	Succeed
Edit item data	Edit item data	Successfully changed item data	Succeed
The item data input is correct	Add missing item data	Added new item data	Succeed
Incorrect item data input	Add existing item data	Shows error, item already exists	Succeed
Look for sale items	Enter item keywords	Display sales items	Succeed
Delete sales transactions	Delete sales transactions	Successfully deleted the sales transaction	Succeed
Add and subtract sales transactions	Add and subtract transaction totals	Add and subtract transaction totals	Succeed
Input sales transactions	Add sales transactions	Successfully entered sales	Succeed
View sales reports	Displays report data	Successfully displays sales report	Succeed
Print sales transactions	Displays transaction print	Successfully printed transaction	Succeed

$$\frac{\sum Testing\ successful}{\sum total\ testing} x100\% = \frac{16}{17} x\ 100\% = 94\% \quad (1)$$

Table 1 shows test results. The black box explains that the test scenario in the information system is in accordance with the expected results, and the menus tested produce the results that are valid. Testing Black box indicates that the application is capable of handling data, both valid data and data that is not valid, with a 94% success rate and the examiner does not need to have knowledge of a particular programming language [15]. The results of the Blackbox test have obtained 94% results, which means that the researcher has met the application mechanics that can be used.

e. Expert Testing Results

Testing by experts is testing the validation of the system with the knowledge possessed by the expert. Expert testing is carried out by two experts in order to get the appropriate results and valid scores. To get validation from experts, the researcher conducted two tests at once, namely Front-End testing and Back-End application testing. This can be seen in Table 2. Also, the Likert scale is shown in Table 3. Then, Equation (2) computes the percentage of the obtained value.

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Table 2. Test Results by Experts

No	Question	Evaluation				
		SB	B	C	TB	STB
1	How do you assess the UI interface of this application?	1		1		
2	What do you think, is this application effective in managing inventory?		2			
3	What do you think about the features in the inventory application?		2			
4	Does the website have good application performance in terms of response speed?		1	1		
5	How would you rate your overall experience with this app?		1	1		
	Total			38		
	Maximum value			50		

Table 3. Likert Scale Tabulation

Appraisal Value	Number of Assessments	Total (Scale x Amount)
5	1	5
4	6	24
3	3	9
2	0	0
1	0	0
	Total Score	38
	Maximum Score	50

$$Percentage\ (\%) = \frac{obtained\ value}{Maximum\ Value}\ x\ 100\%$$
$$Percentage\ (\%) = \frac{38}{50} x\ 100\% = 76\% \quad (2)$$

f. User Testing Results

This user application is run by users; the percentage of user testing using several respondents from shop owners for the results is as follows:

Table 4. Test Results by Users

No	Question	SB	B	C	TB	STB
1	Is the appearance of the Dewi Store application attractive?	1	0	0	0	0
2	Does the shop goddess application help the owner in the process of selling goods?	1	0	0	0	0
3	Does the shop goddess application suit the owner's needs?	1	0	0	0	0
4	Does this application match the expected function?	1	0	0	0	0
5	Is this application easy to operate?	0	0	1	0	0
6	Is this application easy to learn?	0	0	0	1	0

In this way, the following are the results of testing by users, with one respondent who can use the following formula. This study uses one respondent's shop to have a clear research focus, and is able to measure the effectiveness of the application. Equation (3) computes the total score percentage.

Table 5. Likert Scale Tabulation

Appraisal Value	Number of Assessments	Total (Scale x Amount)
5	4	20
4	0	0
3	1	3
2	1	2
1	0	0
	Total Score	25
	Maximum Score	30

$$Total\ score\ percentage\ (\%) = \frac{25}{30} x\ 100\% = 83\% \quad (3)$$

Table 4 and 5 shows that the result of multiplying the score for each question in the study by the Likert scale weight. The maximum score on the Likert scale is multiplied by the number of questions for the expected value, where the value "very good" has a value of 5. The results of testing carried out by users show that if the research reaches 90% it can be said to be feasible.

The Blackbox test results explain that the test scenario in the information system corresponds to the expected results and the menus tested obtained valid results. Blackbox testing shows that the application is able to handle data, both valid data and invalid data with a success percentage of 94% and the tester does not need to have knowledge of a particular programming language.

The average test by experts on the sales inventory system at the Dewi Grocery Store resulted in an average percentage assessment of 76% with appropriate results. Thus, it can be said that in terms of functional and non-functional system flow, the sales inventory system is valid for use, so that this system can be applied by Toko Sembako Dewi in providing information regarding sales inventory reports, carrying out inventory of goods effectively, efficiently, structured and as evaluation material for users. Based on the results and testing, it can be concluded that the sales inventory system designed is a functional requirement that is expected to prevent errors; besides that, this system is also not difficult to use.

Average testing by users on the sales inventory system produces an average percentage assessment of 83%, with decent results. Therefore, it can be said that in terms of functional and non-functional system flow, the sales inventory system is suitable for users, so that this system can be used by the Dewi Grocery Store. Based on the results and testing, it can be described that the sales inventory system designed is a functional requirement that is expected to prevent errors. Apart from that, this system is also user-friendly, so that users have no difficulty in running this system.

Web-based systems reduce the logging errors that often occur in manual methods. Errors such as double logging, data loss, or stock mismatches can be minimized with the automation and data validation features available in the system. This improves inventory accuracy and ensures that the data used in decision-making is more reliable.

In terms of accessibility, web-based systems allow store owners to monitor inventory in real-time from various locations, without having to be physically in the store. This provides greater flexibility in business management and allows for quick response to stock changes or customer demand.

The implementation of web-based systems also improves data transparency and security. With manual systems, the risk of data loss or manipulation is higher, while web-based systems can be equipped with security features such as encryption and user access control.

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4. Conclusion

The use of the Waterfall method in developing an inventory information system facilitates the design and implementation process with systematic steps: requirements, design, implementation, verification and maintenance. System testing using the Blackbox Testing method shows that the system runs as expected with the following test scores: Blackbox 94%, expert 76%, and user 83%. These results indicate that the web sales inventory information system at Dewi grocery stores is suitable for use.

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