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Inventory Information System with Web-Based Stock Forecasting for Building Supply Stores

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Abstract

Surra Building Shop is an MSME engaged in the sale of building materials that still uses a manual system for sales recording and inventory management. The problems identified include stock discrepancies, recording errors, and difficulties in determining future inventory requirements. This study aims to design and develop a web-based inventory information system that integrates inventory management and stock forecasting features. The system development method used was the Waterfall model, which consists of the stages of requirements analysis, system design, implementation, testing, and maintenance. In addition, the Weighted Moving Average (WMA) method was applied to generate stock forecasts based on historical sales data. The results showed that the developed system improved the efficiency of inventory data management, reduced recording errors, and provided stock forecasting recommendations to support more accurate decision-making. This system is expected to serve as a solution for similar MSMEs in optimizing inventory management and supporting sustainable business growth.

INTRODUCTION

Building supply stores are businesses engaged in sales activities and inventory management with relatively high stock turnover rates. The goods managed in building supply stores generally consist of various types of materials, such as cement, sand, bricks, ceramics, paint, pipes, iron, and other construction supplies. The variety of products and changing customer demands make inventory management an essential aspect of maintaining smooth store operations (Jean, 2024; Lee et al., 2018; Madamidola et al., 2024; Masudin et al., 2018; Villegas-Ch et al., 2024).

Surra Building Shop is a business engaged in the retail and wholesale sales of building materials. Based on observations, the process of sales recording and inventory management at the store is still performed manually using books and transaction notes. This manual recording system may cause several problems, including recording errors, delays in report preparation, discrepancies between physical stock and recorded data, and difficulties in quickly determining inventory levels (Mahzan & Lee, 2021; Paul & Lestari, 2015; Pramalegawa et al., 2025; Putra et al., 2025; Yuniarto & Siregar, 2025).

The implementation of a web-based inventory information system can provide a solution to support the management of product data, transactions, and inventory reports in a more structured manner. Previous research has shown that a website-based inventory information system developed using the Waterfall method can improve inventory data management effectiveness and provide better documentation (Harits et al., 2024). Furthermore, the implementation of a web-based inventory and cashier system in building material stores

can support transaction recording, inventory management, and operational optimization (Muhammad Fahrizal Amim et al., 2025).

Another challenge in inventory management is determining the appropriate amount of stock required for future periods. Insufficient stock may result in product shortages, which can disrupt customer services. Conversely, excessive stock may lead to product accumulation and hinder capital turnover. Therefore, a stock forecasting feature is needed to utilize historical sales data as a basis for providing inventory recommendations (Chowdhury et al., 2025; Gosal et al., 2026; Purnamasari et al., 2023; Wang & Wang, 2025; Zohra Benhamida et al., 2021).

The Weighted Moving Average (WMA) method is one of the forecasting techniques that can be applied to predict inventory requirements based on previous sales data. This method assigns different weights to historical data, with greater emphasis placed on more recent data, allowing forecasts to better represent current demand conditions. Several studies have demonstrated that the WMA method can be applied in inventory forecasting and can assist in estimating future stock requirements (Hidayanti et al., 2024; Merici & Saprudin, 2024).

Research on website-based inventory information systems was conducted by Harits et al., (2024). The study developed an inventory system using the Waterfall method to support more structured inventory data management. The results indicated that a website-based system could assist in recording product data, managing stock, and preparing reports. However, the study focused primarily on general inventory management and did not include a stock forecasting feature using the Weighted Moving Average method.

Another study was conducted by Muhammad Fahrizal Amim et al., (2025), who designed a web-based inventory and cashier system for a building material store. This research is relevant because it involved a similar research object, namely a building material store. The developed system supported transaction recording, product data management, and operational optimization. The difference between the previous study and the present research lies in the integration of a stock forecasting feature to assist store owners in estimating future inventory requirements.

In the field of inventory forecasting, Merici & Saprudin (2024) applied the Weighted Moving Average method to predict inventory requirements at CV. Multipaper Stationery. The results showed that the WMA method could estimate product requirements based on historical sales data. This method assigns weights to data from specific periods, allowing forecast results to support inventory planning decisions.

A similar study was conducted by Hidayanti et al. (2024), who applied the Weighted Moving Average method in a laundry inventory forecasting system. The findings showed that WMA could be implemented in stock forecasting systems to assist in predicting future inventory requirements. This demonstrates that the WMA method can be applied to various inventory management contexts as long as sufficient historical data are available for processing.

Based on previous studies, it can be concluded that web-based inventory information systems can support inventory data management processes, while the Weighted Moving Average method can be utilized to forecast stock requirements. This research combines these two concepts into a web-based sales and inventory information system equipped with a stock forecasting feature for Surra Building Shop. Therefore, the developed system functions not only as a platform for recording transactions and monitoring inventory but also as a decision-

support tool for procurement planning.

Three research gaps motivate this study: (1) web-based inventory systems for building supply stores remain limited and generally do not incorporate stock forecasting features; (2) applications of the WMA method have mainly focused on stationery and laundry inventory, rather than building material stores with diverse products and fluctuating sales patterns; and (3) previous studies have not integrated a web-based inventory system with the WMA method specifically to support procurement decision-making in building supply stores. The novelty of this research lies in integrating a web-based inventory information system with the

WMA forecasting method within the context of building material stores, combining two previously separate concepts—web-based inventory systems (Harits et al., 2024; Muhammad Fahrizal Amim et al., 2025) and WMA forecasting methods (Hidayanti et al., 2024; Merici & Saprudin, 2024)—into an integrated decision-support system for procurement planning. The application of WMA in building supply stores represents an additional contribution, as previous studies primarily focused on inventory objects with relatively homogeneous products.

Based on these problems, this study aims to design and develop a web-based sales and inventory information system for Surra Building Shop by implementing the Weighted Moving Average method for stock forecasting. The developed system is expected to support transaction recording, product data management, inventory monitoring, report generation, and stock requirement recommendations based on historical sales data. Theoretically, this research contributes to the development of information systems and inventory management knowledge by integrating a web-based information system with the WMA forecasting method into a tested framework for building material stores. Practically, this research provides benefits for store owners by improving inventory management efficiency, reducing recording errors, accelerating report preparation, and supporting more accurate procurement decisions. It also provides a framework that can be adopted and modified by other store managers experiencing similar challenges, while offering future researchers a tested system that can be further enhanced through additional features, such as minimum stock notifications or comparisons with other forecasting methods, including Simple Moving Average and Exponential Smoothing.

METHOD

This research used a Research and Development (R&D) approach because it developed a product in the form of a web-based sales and inventory information system equipped with a stock forecasting feature. The developed system was designed to assist Surra Building Shop in managing product data, sales transactions, incoming and outgoing inventory, reports, and stock requirement recommendations based on historical sales data.

The system development method used was the Waterfall model. This method was selected because it provided systematic stages and was suitable for system development with clearly identified requirements. The Waterfall stages included requirements analysis, system design, implementation, testing, and maintenance (Harits et al., 2024). This model has also been widely applied in developing web-based inventory information systems due to its structured development process (Harits et al., 2024; Muhammad Fahrizal Amim et al., 2025).

The requirements analysis stage was conducted through observation, interviews,

documentation, and literature studies. Observations were carried out to identify the existing sales recording and inventory management processes at Surra Building Shop. Interviews with the store owner were conducted to obtain information regarding limitations of the existing manual system and required system features. Documentation involved collecting product data, transaction data, inventory data, and historical sales data used for stock forecasting calculations.

The system design stage involved developing process flows, database structures, user interfaces, and stock forecasting features. The system design was represented using Unified Modeling Language (UML), including Use Case Diagrams, Activity Diagrams, and Class Diagrams, to illustrate user interactions and workflows related to sales and inventory management.

The implementation stage involved developing the web-based information system based on the system design. The developed system included several main features, including login, dashboard, product data management, product categories, suppliers, sales transactions, incoming inventory, outgoing inventory, reports, and stock forecasting. The sales transaction feature automatically reduced inventory based on the quantity of products sold, while the incoming inventory feature increased stock based on received product data from suppliers.

The stock forecasting feature implemented the Weighted Moving Average (WMA) method. This method was used to estimate future inventory requirements based on historical sales data. The WMA method assigns greater weight to more recent sales data, allowing the forecast results to better represent current demand conditions. The Weighted Moving Average formula is presented as follows:

$$WMA = \frac{(D1\ \times W1 + D2 \times W2 + D3 \times W3 + \cdots + Dn \times Wn)}{(W1 + W2 + W3 + \cdots + Wn)}$$

Description:

WMA = stock prediction result

D = sales data for a given period

W = weights in each period

n = number of data periods used

The results of the WMA calculation were used as recommendations for determining the amount of stock required in the following period. The forecasts were not considered absolute values but served as decision-support information for store owners during the procurement process.

The system testing stage was conducted using Black Box Testing to ensure that each system function operated according to user requirements. The tested features included login, product data management, sales transactions, incoming inventory, outgoing inventory, reports, and stock forecasting. The stock forecasting results were also validated by comparing the system-generated calculations with manual calculations using the WMA method.

RESULTS AND DISCUSSION

A. System Implementation Results

The result of this study is a web-based sales and inventory information system equipped with stock prediction features using the Weighted Moving Average (WMA) method. This system was built to help the process of managing goods data, sales transactions, incoming stock, outgoing stock, reports, and stock demand prediction at the Surra Building Store.

The system has a login page as a user authentication process before logging into the system. This feature is used to restrict access so that only users who have an account can manage data. After successfully logging in, users will be directed to a dashboard page that displays a summary of key information, such as item data, sales transactions, stock of goods, and reports. The application of a web-based system like this is in line with the research of Harits et al. (2024) who stated that a website-based inventory system can help manage inventory data in a more structured manner. The implementation of the login feature can be seen.

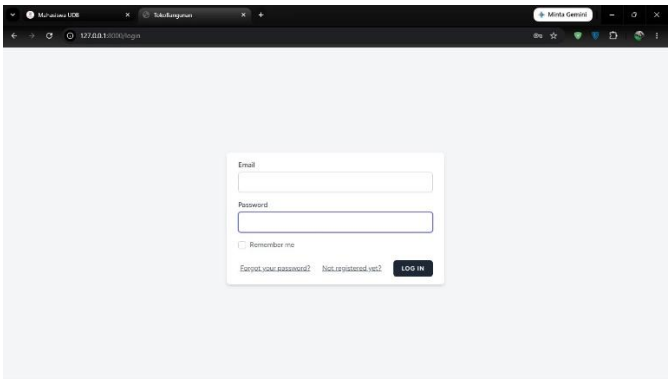

Figure 1. Login Features
Source: System implementation results (2026)

The item data feature is used to manage the information of goods available in the store, such as the name of the item, category, supplier, unit, price, and stock quantity. With this feature, users can add, change, delete, and view item data more easily. The data stored in the system is also the basis for the sales transaction process, stock management, and report making. The results of the implementation of the goods data feature can be seen in figure 2.

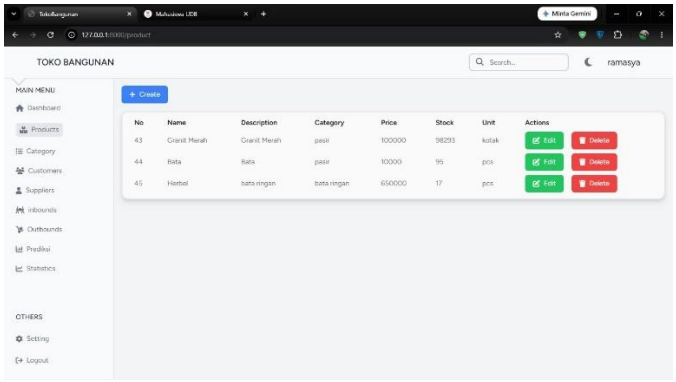

Figure 2. Item Data Features
Source: System implementation results (2026)

The sales transaction feature is used to record the sale of goods to customers. When a transaction is saved, the amount of stock of goods will be automatically reduced according to the number of goods sold. This process helps reduce the risk of stock recording errors that often occur in manual systems. This is in accordance with the research of Amim et al. (2025) which shows that web-based inventory and cashier systems can help record transactions and support the optimization of material store operations. The implementation of the transaction feature can be seen in figure 3.

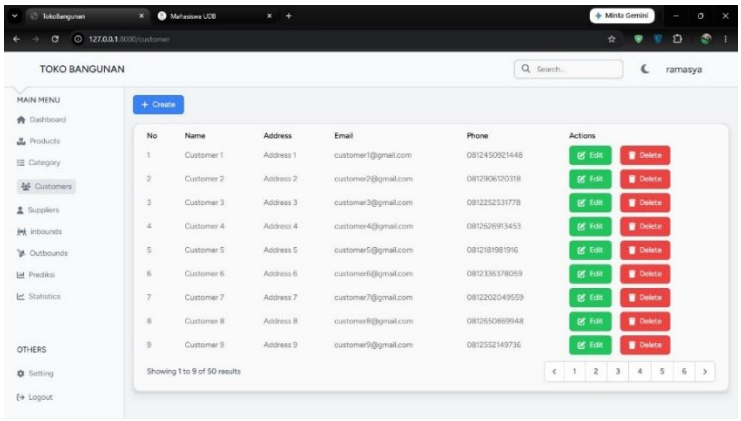

Figure 3. Sales Transaction Features
Source: System implementation results (2026)

The incoming stock feature is used to record the addition of goods from suppliers. Each incoming stock data stored will increase the amount of inventory in the system. With this feature, the history of stock additions can be well documented and make it easier for users to check inventory. In addition, the system also provides a report feature that can display sales data, stock of goods, incoming stock, outgoing stock, and stock prediction results. The incoming stock feature can be seen in figure 4.

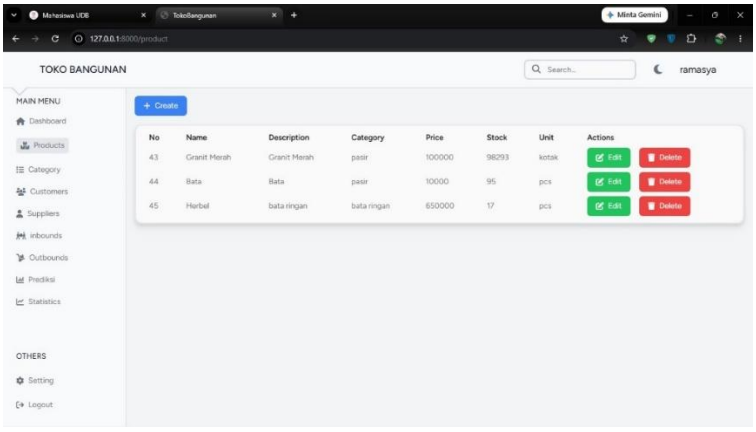

Figure 4. Incoming Stock Features
Source: System implementation results (2026)

The stock prediction feature is used to forecast the demand for goods in the next period based on historical sales data. The method used is the Weighted Moving Average, which is a forecasting method that gives weight to historical data, with greater weight to the latest data.

The WMA method is suitable because it is able to produce an estimate of stock needs based on previous sales patterns (Hidayanti et al., 2024; Merici & Saprudin, 2024).

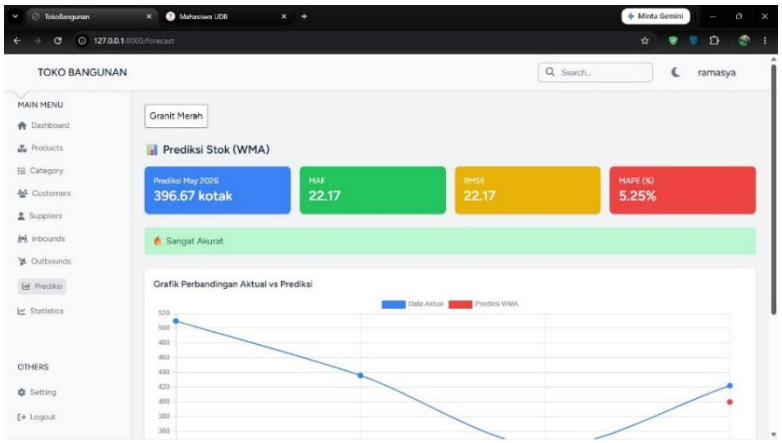

Figure 5. Stock Prediction Features with Weighted Moving Average
Source: System implementation results (2026)

B. System Test Results

The system test was carried out using the Black Box Testing method. This test aims to ensure that every feature on the system runs according to the user's needs. The test is carried out by providing input to each feature, then seeing if the output is in accordance with the designed function. The Black Box Testing method is suitable for use in web-based information systems because it focuses on testing system functions from the input and output sides (Maulana et al., 2023).

Table 1. Black Box Testing Results

No	Tested Features	Testing Scenarios	Expected Results	Status
1	Login	The user enters the correct email and password	The system successfully logged into the dashboard	Successful
2	Goods Data	Users add new item data	Goods data is stored into the system	Successful
3	Goods Data	The user changes the item data	Item data is successfully updated	Successful
4	Sales Transactions	The user saves the sales transaction	Transactions saved and stock reduced automatically	Successful
5	Incoming Stock	The user adds incoming stock data	The stock of goods increases according to the number of inputs	Successful
6	Reports	The user opens the sales and stock report	The system displays reports according to the stored data	Successful
7	Stock Prediction	The user performs the stock prediction process	The system displays the results of stock predictions using WMA	Successful

Source: System calculation results (2026)

Based on the test results, all the main features of the system can run according to the functions that have been designed. The system is able to record data on goods, sales transactions, incoming stock, outgoing stock, reports, and stock predictions. These results show

that the system can be used to help the inventory management process at the Surra Building Store in a more structured manner.

C. Weighted Moving Average Calculation Results

Stock prediction in this system uses the Weighted Moving Average (WMA) method by utilizing historical data on goods sales. In this calculation example, the last three sales periods with weights of 1, 2, and 3 are used. The greatest weight is given to the most recent period because the latest data is considered to be more reflective of current demand conditions. The formula of the Weighted Moving Average method is as follows:

$$WMA = \frac{(D1 \times W1 + D2 \times W2 + D3 \times W3)}{(W1 + W2 + W3)}$$

Description:
WMA = stock prediction result
D1 = first period sales data
D2 = second period sales data
D3 = third period sales data
W1, W2, W3 = weight of each period
An example of calculating the prediction of cement goods stock is as follows:

$$WMA = \frac{(120 \times 1 + 135 \times 2 + 150 \times 3)}{(1 + 2 + 3)}$$
$$WMA = \frac{(120 + 270 + 450)}{6}$$
$$WMA = \frac{840}{6}$$
$$WMA = 140$$

Based on the results of these calculations, the prediction of the demand for cement stock in the next period is 140 units.

Table 2. WMA Calculation Results

No	Item Name	Period 1	Period 2	Period 3	Weight	WMA Prediction Results	Actual Stock	Differences
1	Cement	120	135	150	1, 2, 3	140	145	5
2	Wall Paint	35	42	48	1, 2, 3	44	45	1
3	PVC Pipe	80	75	90	1, 2, 3	83	85	2

Source: System calculation results (2026)

Based on Table 2, the Weighted Moving Average method can generate stock predictions based on sales data of the previous three periods. Cement goods have a prediction result of 140 units, while the actual stock in the next period is 145 units with a difference of 5 units. Wall paint items have a prediction result of 44 units with an actual stock of 45 units so the difference is 1 unit. Meanwhile, PVC pipe goods have a prediction result of 83 units with an actual stock of 85 units so the difference is 2 units.

These results show that the WMA method can be used as a basis for recommendations in determining the stock needs of goods in the next period. The difference between the predicted results and the actual stock shows that the prediction results are not always exactly the same as the actual conditions, but can still help store owners in estimating inventory needs in a more measurable way. With the stock prediction feature, the procurement process is not only based on manual estimates, but also supported by historical sales data.

To find out the level of compatibility between the prediction results and the actual data, an error value is calculated. Error calculation is used to see how large the difference between the results of stock predictions using the Weighted Moving Average method and the actual data in the next period. The smaller the error value produced, the closer the prediction results are to the actual condition. The error calculation formula used is as follows:

$$Error\ (\%) = \frac{(Data\ Aktual - Hasil\ Prediksi)}{Data\ Aktual} \times 100\%$$

Description:
Error (%) = percentage of prediction error
Actual Data = actual sales or inventory requirements
Prediction Result = calculation result using the WMA method
An example of WMA error calculation for cement stock is as follows:

$$Error\ (\%) = \frac{(145 - 140)}{145} \times 100\%$$
$$Error\ (\%) = \frac{5}{145} \times 100\%$$
$$Error\ (\%) = 3{,}45\%$$

Based on the results of error calculation, the Weighted Moving Average method can provide an overview of the level of prediction error on each item.

Table 3. WMA Error Calculation Results

No	Item Name	Prediction Results	Actual Stock	Differences	Error
1	Semen	140	145	5	3,45%
2	Wall Paint	44	45	1	2,22%
3	PVC Pipe	83	85	2	2,35%

Source: System calculation results (2026)

Based on the table of error calculation results, it can be seen that each item has a different level of prediction difference. This difference occurs because the sales pattern of each item is not always stable in each period. Goods with relatively stable sales patterns tend to produce smaller error values, while goods with high enough demand changes can produce larger error values. The results of the error calculation are used as an evaluation of the accuracy of stock predictions produced by the Weighted Moving Average method. The error value is obtained from the difference between the actual data and the prediction results, then calculated in the form of a percentage. The smaller the error percentage, the closer the prediction results are to the actual data. Thus, error calculation can be used to assess whether the WMA method is

suitable to be used as a decision-making support in the procurement process of stock of goods.

The implementation of a web-based sales and inventory information system at Surra Building Stores can help solve the problem of manual record-keeping. Before the system, the recording of sales and inventory of goods was still carried out using books and transaction memoranda. This method has the potential to cause recording errors, delay in reporting, and inconsistencies between stock data and the physical condition of goods. Once the system is implemented, goods, transactions, and stock data can be managed centrally through the database.

The system built also makes it easier for users to monitor the movement of stock of goods. Each sales transaction will automatically reduce the amount of stock, while incoming stock will increase the amount of inventory. This process makes stock data easier to monitor and reduces the need for repetitive manual checking. These results are in line with the research of Harits et al. (2024) and Amim et al. (2025) which show that web-based inventory systems can help manage inventory and transactions more effectively.

Apart from being a recording medium, this system also has a stock prediction feature using the Weighted Moving Average method. This feature leverages historical sales data to forecast stock demand in the next period. The prediction results can be used as recommendations for store owners in determining the number of goods that need to be provided. Thus, procurement decisions are not only based on manual estimates, but are also supported by previous sales data.

The application of the WMA method in this system is in accordance with the research of Merici and Saprudin (2024) and Hidayanti et al. (2024) which show that the Weighted Moving Average method can be used to predict inventory needs based on historical data. This method gives more weight to the latest data so that the prediction results better reflect the current demand conditions. In Surra Building Stores, this feature can help reduce the risk of understock or overstock.

Overall, this sales and inventory information system with stock predictions can help improve the effectiveness of data management at Surra Building Stores. The system is able to integrate the process of recording goods, sales transactions, stock management, reports, and stock predictions in one web-based application. With this system, store owners can obtain stock information and reports more quickly, and use prediction results as a consideration in making decisions about procuring goods.

CONCLUSION

Based on the results of the research conducted, the web-based sales and inventory information system at Surra Building Shop was successfully designed and developed to support the management of product data, sales transactions, incoming and outgoing inventory, reports, and stock forecasting. The system replaced the manual recording process, allowing sales and inventory data to become more structured, accessible, and well documented. The implementation of the Weighted Moving Average (WMA) method enabled the system to forecast stock requirements based on historical sales data. The forecast results provided recommendations for store owners in determining the quantity of products required for the following period. With the stock forecasting feature, the procurement process was no longer based solely on manual estimation but was also supported by historical sales data.

The results of testing using Black Box Testing showed that the main system features operated according to user requirements, including login, product data management, sales transactions, incoming inventory, reports, and stock forecasting. Therefore, the developed system improved inventory management effectiveness, minimized recording errors, accelerated report preparation, and supported decision-making in inventory procurement. For further development, the system can incorporate additional features, such as minimum stock notifications, to alert store owners when inventory levels approach predetermined limits. Furthermore, the WMA method can be compared with other forecasting methods, such as Simple Moving Average and Exponential Smoothing, to identify the method that provides the most accurate forecasting results.

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