

Implementation of Moving Average for Forecasting Inventory Data Using CodeIgniter

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Abstract: The purpose of this study is to be able to apply a manual inventory forecasting system with the moving average method in order to speed up the decision-making process and be able to minimize the error rate in calculating stock in the warehouse. The results of inventory forecasting in 2023 have an average of 192 for 116 BR animal feed items. Based on the results of calculating the average amount, a satisfaction level of 3,825 was obtained and if you follow the reference of Kaplan and Norton satisfaction level, the conclusion that can be drawn is that the level of user satisfaction with the inventory application is included in the satisfied category. So that the indications shown are positive from the PIECES model, namely users are satisfied with this inventory application.

Keywords: Forecasting; Inventory; Moving Average; PIECES; Stock;

1. INTRODUCING

Information technology is not only important as a means of communication via electronics but is an important device that should be owned in business as a means to coordinate and archive important documents[1]–[3]. Information Technology is a process of processing, storing, and disseminating illustrated, vocal, text, and numerical information through micro-electronics based on a combination of telecommunications and computing.

Inventory is any type of goods that are the main object of the company's activities that are available for processing in the production process or ready to be sold to the public[4], [5]. The main function of the inventory is to provide a sustainable supply of materials. For this function to work effectively, business processes must try to find common ground between too many and too few, and without ever running out of stock. However, too little inventory can also make you unable to meet market demand and possibly make customers move elsewhere.

CV ABC has several branches in several districts in Lampung province, where sales and purchase data are carried out by recording daily sales books obtained from copies of cashier's receipts or sometimes only using copies of notes. Incoming and outgoing goods are not well recorded and structured. As a result, when consumers want a certain product, the store or employee will find it difficult to find the item whether it is still available or out of stock. To find out the stock of goods, employees must manually calculate one by one the goods so that it takes a relatively long time. The old information resulted in employees who would report to the administration of ordering goods to be slow in terms of adding or not adding new stock of goods.

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Moving averages are the same as practicing the simple method of reading price movements over time[5], [6]. This is in accordance with the meaning of the moving average, namely using the average closing price of a currency pair that moves from time to time. There are no specific rules governing the timeframe that must be used in moving average calculations. The smaller the timeframe used, the more sensitive the indicator will be to price changes in the short term.

Research related to the moving average method, the first study is the calculation of forecasts for the coming period based on the calculation of the previous quarterly data and can also be done based on the selection of the desired period. The purpose of this research is to build a prediction system for future sales value to increase revenue[7]. The next research is to make a sales forecasting system using the single moving average method. This single moving average method is used for forecasting in determining how much production to provide in the coming period. This forecasting system was created using the Waterfall Model system development method, the system design uses UML and the PHP programming language and MySQL database[8]. The next research is to use the Single Moving Average method and to find out how accurate the forecasting results are using the Mean Absolute Deviation, Mean Square Error, and Mean Absolute Percentage Error. The data used is sales data for January-December 2016 on a medical device item, namely easy touch cholesterol strips with forecasting calculations using an average of 3 months[9].

The purpose of this study is to be able to apply a manual inventory forecasting system with the moving average method in order to speed up the decision-making process and be able to minimize the error rate in calculating stock in the warehouse.

2. METHOD

The research stage is one of the important aspects that must be carried out in the research methodology[10], [11]. The research stages are the steps in solving the problems carried out in research. The stages of the research can be seen in Figure 1.

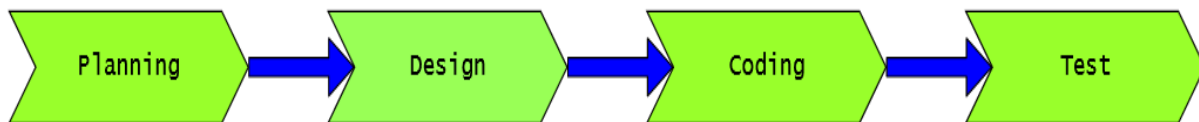


Figure 1. Research Stage

The stages in this study are divided into several steps, namely

Planning

The planning stage is the stage that must be planned when going to do research, the data that is planned. The stages of problem formulation carry out the data collection process that occurs in the system that is currently running at the company to explore how the old system worked and observed it to serve as a problem formulation. Setting goals. Setting goals serves to clarify what is the target of this research.

Design

At this stage a design will be carried out using Usecase and CRC Card. The design use case diagram describes the course of the system to be made. The use case describes an interaction between the actor and the system to be created. CRC Card design is a technique to check for interactions between objects and is also used to determine the class required by a system.

Coding

Create programs with the programming language used, for web-based applications using the PHP programming language with the CodeIgniter Framework

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Test

Conduct testing using Blackbox Testing on the system that has been made, whether there are still errors in making the program or not and testing user satisfaction using the PIECES (Performance, Information, Economic, Control, Efficiency, Service) testing method[12]-[14].

3. RESULT AND DISCUSSIONS

Usecase diagrams describe the course of the system to be created. The use case describes an interaction between the actor and the system to be created. The following Usecase diagram in Figure 2 below

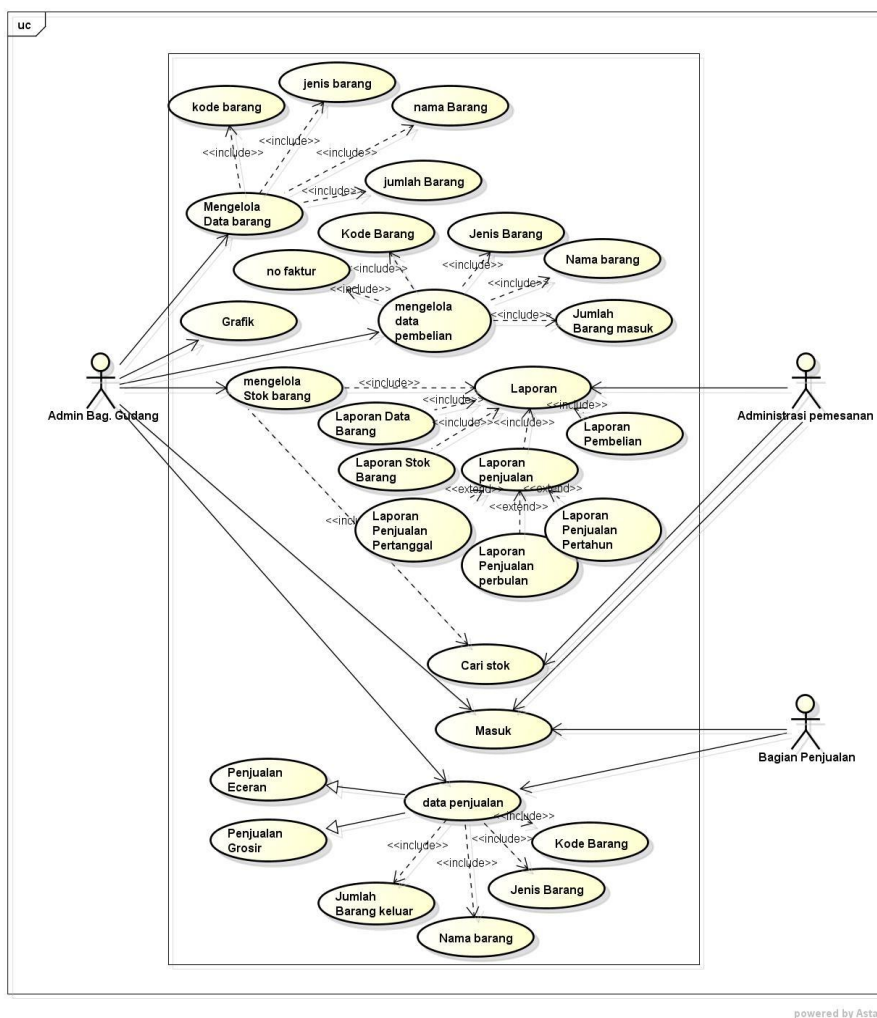


Figure 2. Usecase Diagram

Application Implementation Using CodeIgniter

The main menu interface is the page that appears after logging in/entering as admin. In the Admin Main Menu view there is a menu bar and main menu. The menu bar consists of transactions, returns, graphics, reports, logout, usernames, and active status. For the main menu section there are retail sales, wholesale sales, suppliers, categories, items, users, reports, and purchases.

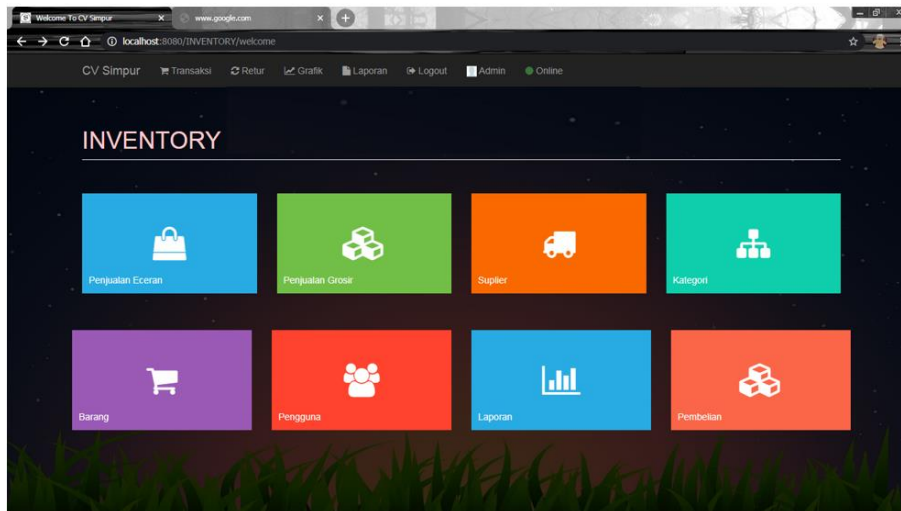


Figure 3. Interface Dashboard

The stock chart interface is a menu that will appear when the admin selects the stock chart in the chart menu. The graph will be displayed by the system when the admin selects the view button. Figure 3 is a graphic display of stock items by category.

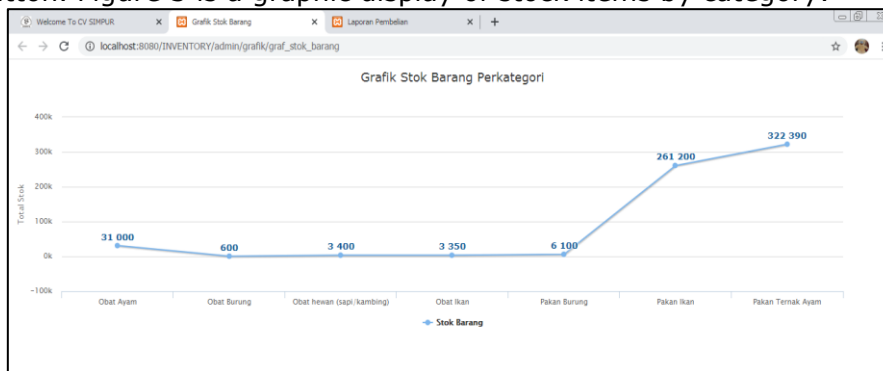


Figure 4. Interface Inventory Chart

Inventory Forecasting Using Moving Average

Inventory data used for this inventory forecasting simulation uses 116 BR animal feed data. The following is an example of inventory data for 2022 that has been obtained.

Table 1. Inventory Data

Month	Quantity
October	160
November	185
December	210

The data above is inventory data for October, November and December for 2022. Then forecast inventory for 2023 which will be the company's reference in forecasting inventory. The Moving Average formula is as follows:

$$MA = \Sigma X / \text{Number of Periods} \quad (1)$$

Information :

MA = Moving Averages

ΣX = Overall Sum of all calculated time period data

Number of Periods = Number of Moving Average Periods

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The inventory forecast for January 2023 is

$$MA = \frac{(160+185+210)}{3} = 185$$

The inventory forecast for February 2023 is

$$MA = \frac{(185+210+185)}{3} = 193$$

The inventory forecast for March 2023 is

$$MA = \frac{(210+185+193)}{3} = 196$$

The inventory forecast for April 2023 is

$$MA = \frac{(185+193+196)}{3} = 191$$

The inventory forecast for May 2023 is

$$MA = \frac{(193+196+191)}{3} = 193$$

The inventory forecast for June 2023 is

$$MA = \frac{(196+191+193)}{3} = 193$$

The inventory forecast for July 2023 is

$$MA = \frac{(191+193+193)}{3} = 192$$

The inventory forecast for August 2023 is

$$MA = \frac{(193+193+192)}{3} = 193$$

The inventory forecast for September 2023 is

$$MA = \frac{(193+193+192)}{3} = 193$$

The inventory forecast for October 2023 is

$$MA = \frac{(192+193+193)}{3} = 193$$

The inventory forecast for November 2023 is

$$MA = \frac{(193+193+193)}{3} = 193$$

The inventory forecast for December 2023 is

$$MA = \frac{(193+193+193)}{3} = 193$$

Based on the results of calculations using the moving average method for forecasting inventory for 2023 as shown in Table.

Table 2. Forecasting Inventory Data Year 2023

Month	Quantity
January 2023	185
February 2023	193
March 2023	196
April 2023	191
May 2023	193
June 2023	193
July 2023	192

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August 2023	193
September 2023	193
October 2023	193
November 2023	193
December 2023	193

Test Results Using PIECES

Based on the results of distributing questionnaires to 5 users of this inventory application using a Likert scale to determine the level of user satisfaction. By determining the level of satisfaction as above for the level of user satisfaction with the inventory application[15], the average satisfaction level is obtained based on the domain in the PIECES analysis in Table 3 below.

Table 3. Test Results Using PIECES

Indicator	Quantity
Performance	3,95
Information	3,8
Economic	4,05
Control	3,7
Efficiency	3,9
Service	3,55
Total	3,825

Meanwhile, to determine the level of satisfaction using the model defined by Kaplan and Norton with the following levels.

Table 4. Level of Satisfaction Using

Range	Result
1 - 1,79	Very dissatisfied
1,8 - 2,59	Unsatisfied
2,6 - 3,39	Nervous
3,4 - 4,91	Satisfied
4,2 - 5	Very satisfied

Based on the results of calculating the average amount, a satisfaction level of 3,825 was obtained and if you follow the reference of Kaplan and Norton satisfaction level, the conclusion that can be drawn is that the level of user satisfaction with the inventory application is included in the satisfied category. So that the indications shown are positive from the PIECES model, namely users are satisfied with this inventory application.

4. CONCLUSION

The purpose of this study is to be able to apply a manual inventory forecasting system with the moving average method in order to speed up the decision-making process and be able to minimize the error rate in calculating stock in the warehouse. Hasil peramalan persediaan pada tahun 2023 mempunyai rata-rata 192 untuk barang 116 BR animal feed. Based on the results of calculating the average amount, a satisfaction level of 3,825 was obtained and if you follow the reference of Kaplan and Norton satisfaction level, the conclusion that can be drawn is that the level of user satisfaction with the inventory application is included in the satisfied category. So that the indications shown are positive from the PIECES model, namely users are satisfied with this inventory application.

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