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Implementation of the WMA Method in the Stock Forecasting System of Eva Fashion Stores

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ABSTRACT

Eva Fashion Clothing Store is a business selling goods that only sells various kinds of clothing products. In this shop, it is often difficult to predict future product inventory based on previously recorded data. So we need a system that can predict sales to prepare clothing stocks in the future. In developing this forecasting system, the author will use the Weighted Moving Average forecasting method. Forecasting using the weighted moving average method can predict how much stock of goods must be purchased for the next period. Forecasting calculations for the coming period are 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 analyze forecasting inventory for sales of products or goods in the next period and to build a system in predicting future sales value to increase store business.

Keyword : WMA, Forecasting, Eva Fashion

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1. INTRODUCTION

The rapid development and growth of information technology has had a positive impact on industrial, sales and service stores. The existence of information technology changes significantly in the process of transforming business towards digital. This condition allows a decrease in interaction costs thereby increasing interaction. Interaction becomes easier because there is no need to be physically present, more alternatives, cheaper, and more opportunities.

Eva Fashion shop is a business selling goods that only sells various kinds of clothing products. there are various types of clothing with a considerable amount of stock with various types of clothing. Eva Fashion Stores often experience difficulty in predicting product inventory in the future based on previous data. This forecast is very influential on the shop owner's decision to determine the number of products that must be provided by the shop. Some of the problems that are often found in controlling the number of products are approximately the amount of product stock or also the amount of excess product stock. Lack of total product stock results in unfulfilled demand from consumers, excess product stock results in store losses because stores keep capital or products for too long.

To predict sales and inventory data, the author uses a forecasting method that will assist in taking an analytical approach to behavior or patterns from past data, so as to provide ways of thinking, working and completing, and providing a greater level of confidence in the accuracy of the forecast results. which are made. In developing this forecasting system, we will use the Weighted Moving Average forecasting method. Moving Average (MA) is the average value of data movement. In other words, moving average shows a mathematical function where the captured data is averaged. Moving Averages can be used to smooth data. While one variant of the MA is the Weighted Moving Average (WMA). Where the WMA calculation formulation uses the weighting of each data, a greater weight is given to the last data compared to the previous data. This method is used for the prediction process because this method is able to determine the trend that will occur based on existing data.(Ardiana & Loekito, 2018)

2. RESEARCH METHOD

The research method used in this study is to find information about the applications of programming languages into research that uses data processing, such as this study the authors apply web programming to the forecasting system for inventory data at Eva Fashion Stores. In addition, the authors also use the wighted moving avarage method, which is a simple business forecasting method and is often used to predict conditions in the future using a collection of past data (historical data). In Operations and Production Management, the data set here can be the sales volume of the company's history. (Wardah & Iskandar, 2016)

The design of this goods sales forecasting system application is designed to be as simple as possible so that it is easy to understand and makes it easier for users to predict inventory. So that this system can provide benefits for business owners. The interaction used is only owned by one actor, namely the administrator, the administrator can

predict goods using web-based media and the WMA algorithm. After observing the system that is running in forecasting the inventory of goods, still using the manual method by looking directly at the inventory of goods according to the period so that sometimes product inventory errors often occur. The author tries to develop and build a product inventory forecasting system at Eva fashion stores using the weight moving average method. (Setyawan et al., 2016)

The most important activity in the analysis process is understanding all the information contained in a case, analyzing the situation to find out what issues are happening, and deciding what actions must be taken to solve the problem. The following is an analysis of the process on a system with the WMA algorithm. (Silvya et al., 2020)

Formulas for calculating forecasting results with methods Weighted Moving Average :

$$Ft = \frac{\sum (\text{weights for period n}) * (\text{demand in period n})}{\sum \text{weight}}$$

Table 1. Sales Data

No	Month	Shirt	Hijab	Skirt	Pants
1	Jan-20	54 pcs	34 pcs	53 pcs	9 pcs
2	Feb-20	47 pcs	25 pcs	31 pcs	15 pcs
3	Mar-20	59 pcs	54 pcs	50 pcs	18 pcs
4	Apr-20	62 pcs	37 pcs	56 pcs	16 pcs
5	Mei-20	69 pcs	44 pcs	38 pcs	21 pcs
6	Jun-20	57 pcs	28 pcs	33 pcs	11 pcs
7	Jul-20	53 pcs	39 pcs	40 pcs	16 pcs
8	Agu-20	44 pcs	33 pcs	35 pcs	7 pcs

The following is the calculation of the Weighted Moving Average from the table above.

1. $\text{Apr} = \frac{(59*3)+(47*2)+(51*1)}{3+2+1} = \frac{322}{6} = 53.67$
2. $\text{May} = \frac{(62*3)+(59*2)+(47*1)}{3+2+1} = \frac{351}{6} = 58.5$
3. $\text{June} = \frac{(69*3)+(62*2)+(59*1)}{3+2+1} = \frac{390}{6} = 65$
4. $\text{July} = \frac{(57*3)+(69*2)+(62*1)}{3+2+1} = \frac{371}{6} = 61.83$
5. $\text{August} = \frac{(53*3)+(57*2)+(69*1)}{3+2+1} = \frac{342}{6} = 57$
6. $\text{September} = \frac{(44*3)+(53*2)+(57*1)}{3+2+1} = \frac{295}{6} = 49.17$

Error Value :

$$Et = \text{Xt} - \text{Ft}$$

Information:

- Et = error value (error)
- Xt = actual data in period t
- Ft = forecast data for the period

1. April = 62 - 53.67 = 8.33
2. May = 69 - 58.5 = 10.50
3. June = 57 - 65 = -8
4. July = 53 - 61.83 = -8.83

5. August = 44 - 57 = -13

MSE Value :

$$\text{MSE} = \frac{\sum (\text{Actual} - Ft)^2}{\text{n}}$$

Furthermore, the MSE value calculation until August 2020, namely:

1. April = (8.33) 2 = 69.44
2. May = (10.50) 2 = 110.25
3. June = (-8) 2 = 64
4. July = (-8.83) 2 = 78.03
5. August2 = (-13) = 169

Calculation Result:

Table2. Result WMA

No.	Month	Sales	WMA	ERROR	MSE
1	Jan-20	51			
2	Feb-20	47			
3	Mar-20	59			
4	Apr-20	62	53.67	08.33	69.44.00
5	Mei-20	69	58.05.00	10.50	110.25.00
6	Jun-20	57	65	-8	64
7	Jul-20	53	61.83	-8.83	78.03.00
8	Agu-20	44	57	-13	169
9	Sep-20	0	49.17.00	-	-

RESULT AND DISCUSION

In the implementation, the authors run the research results into a web browser media that will produce conclusions after testing. The application that has been designed is a stock forecasting system using the weight moving average method at the eva's fashion shop. The basic concept of an application designed is to collect and compile product data for the previous period so that forecasting can be done. The following are the results of the system design that has been designed:

1. User login page

The user login page is the page used by the user to forecast inventory, where the display of the user page is as follows:

Fig 1. Login Page

To start, the user can enter the registered username and password then the system will automatically display the main menu the system is used for, here is how it looks:

Fig 2. Brand Page

The first page of the system contains the brands of clothing that are sold, can be added, edited and deleted. To add can click the blue plus button, to edit click the edit button on the table, to delete click the delete button on the table. After the product brand is recorded, the user can add the types of goods being sold, such as clothes, pants, headscarves, etc. The following displays add to the types of products being sold :

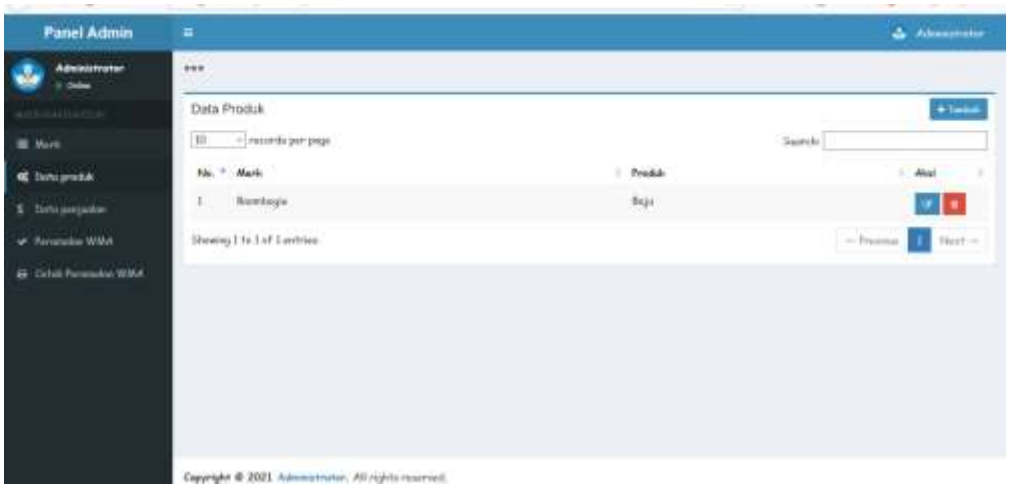


Fig 3. Types of Product's Page

To add sales data, the user can select the sales menu, and will display the following page:

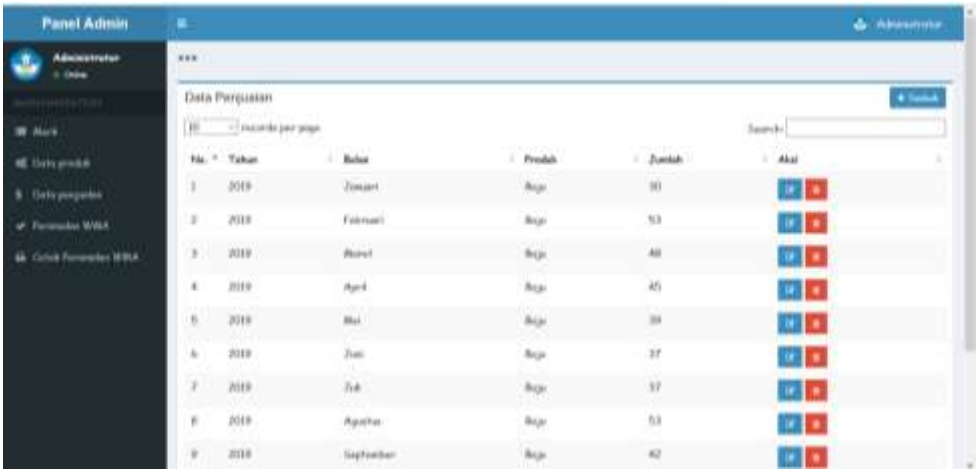


Fig 4. Sales Data Page

Add sales every month via the following sales data add form

Fig 5. Add Sales Page

To display forecasting results, the user can select the "forecasting wma" menu where this menu will display the forecasting page.

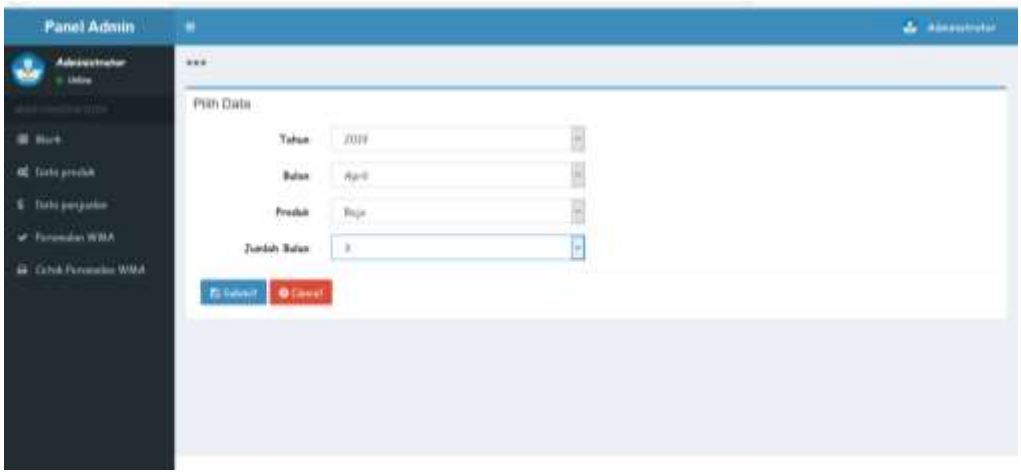
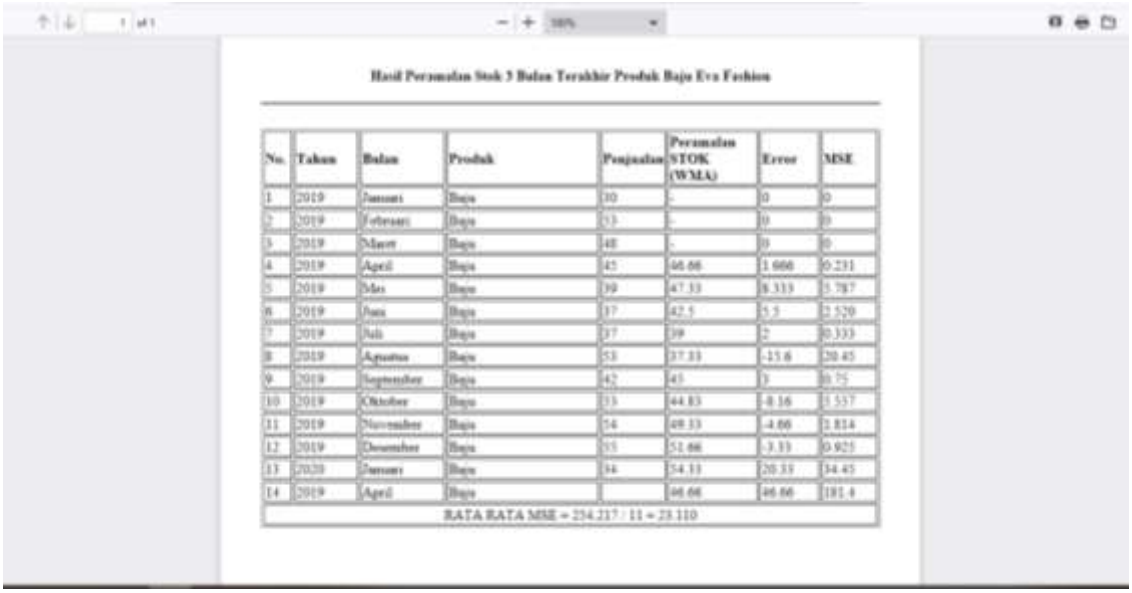


Fig 6. Forecasting Page

After selecting the forecast reference, a report will be displayed showing the results of the calculation using the following WMA method



Hasil Peramalan Stok 3 Bulan Terakhir Produk Baju Eva Fashion

No.	Tahun	Bulan	Produk	Penjualan	Peramalan STOK (WMA)	Error	MSE
1	2019	Januari	Baju	30	-	0	0
2	2019	Februari	Baju	53	-	0	0
3	2019	Maret	Baju	48	-	0	0
4	2019	April	Baju	45	46.66	1.666	0.231
5	2019	Mei	Baju	39	47.33	8.333	5.787
6	2019	Juni	Baju	37	42.5	5.5	3.529
7	2019	Juli	Baju	37	39	2	0.333
8	2019	Agustus	Baju	53	37.33	-15.6	20.45
9	2019	September	Baju	42	43	0	0.75
10	2019	Oktober	Baju	33	44.83	-8.16	5.537
11	2019	November	Baju	54	49.33	-4.66	3.814
12	2019	Desember	Baju	55	52.66	-3.33	0.925
13	2020	Januari	Baju	34	54.33	20.33	34.45
14	2019	April	Baju		46.66	46.66	181.4
RATA RATA MSE = 254.217 : 11 = 23.110							

Fig 7. Report Page

The research has been carried out based on the design analysis and the problems described in the previous chapter, the research produces an output in the form of an inventory forecasting system using the weight moving average method in Eva fashion stores. The use of the Weighted Moving Average (WMA) method, can help Eva's Fashion Shop to find out the demand conditions in the market. The information generated from the WMA has been tested by predictive accuracy, so that the results are appropriate and accurate. This predictive information becomes input data for further optimization of the distribution.

CONCLUTION

The conclusions obtained from this study are:

1. Analysis of the design and problems described in the previous chapter produces an output in the form of an inventory forecasting system using the weight moving average method in Eva's fashion shop.
2. The use of the Weighted Moving Average (WMA) method can help Eva Fashion Stores to find out the demand conditions in the market. The information generated from the WMA has been tested with predictive accuracy, so the results are appropriate and accurate. This predictive information becomes input data for further optimization of the distribution.

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