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FORECASTING COSMETIC INVENTORY ON MS GLOW MABELLA STORE RANGE WITH WMA METHOD

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Abstract

Background : MS Glow Mabella Kisaran shop is a business that is engaged in selling cosmetic products such as make-up cosmetics and care cosmetics located on Jalan Imam Bonjol Kisaran. Cosmetic makeup is a material used to make up yourself with the aim of making it look more attractive or what is often referred to as Make-up. While cosmetic treatments are ingredients that are used on the human body to keep the body healthy and beautiful or often referred to as skincare. **Method** : Forecasting is the art and science of predicting future events using historical data with mathematical models and projecting them into the future. The WMA (Weighted Moving Average) method is the same method as the moving average, but the latest values in the time series are given a greater burden in calculating the forecast. **Result** : The forecast results for June 2022 are between 862 to 995. If the sales results that occur later exceed or are less than the predetermined value from the forecast, the forecast results are declared incorrect. However, if the sales results that occur later are between the values of 862 to 995, the forecast results used are good. So, MS Glow Mabella Store Kisaran can stock up on cosmetics in June 2022 as many as 928 items. This has had a major impact on the demand for cosmetic equipment owned by MS Glow Mabella Store Kisaran. **Conclusion** : Determination of cosmetic inventory is unpredictable, so it is not in accordance with the number of customer.

Keywords: Cosmetics Inventory, Weighted Moving Average Method

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INTRODUCTION

In this era of globalization, the use of information is very important for a company in the process of data entry, data processing, data retrieval, as well as performing fast, precise and accurate calculations so as to facilitate transaction activities within the company[1][2]. In the activity of managing product sales by checking inventory, which is done by checking one by one of each product, of course, it will be difficult for employees to estimate the number of needs that must be ordered from each type of product. The large number of products becomes an obstacle in the sales process which results in errors in checking product inventory, one of which is at the MS Glow Mabella Store Kisaran. MS Glow Mabella Store Kisaran is a business engaged in the sale of cosmetic products such as make-up cosmetics and cosmetic treatments located on Jalan Imam Bonjol Kisaran. Makeup cosmetics are materials used to make up yourself with the aim of making it look more attractive or what is often referred to as Make-up. While cosmetic treatments are ingredients used on the human body to treat the body to keep it healthy and beautiful or often referred to as skincare. According to the results of interviews and observations of MS Glow Mabella Store Kisaran.

The demand for cosmetic products by customers tends to change according to the trends that occur. In general, the use of cosmetics is used by women. This concerns the interests of many people, especially for women in terms of awareness of using make-up and skincare in order to beautify themselves and make the body look healthy and well-groomed.

This has a major impact on the demand for cosmetic supplies owned by MS Glow Mabella Store Kisaran. Determination of cosmetic inventory is unpredictable, so it is not in accordance with the number of customer requests and often experiences a lack of inventory conditions contained in the MS Glow Mabella Store Kisaran. Where the data obtained, namely sales data for 1 year, starting from March 2021 to February 2022 are as follows:

No	Month	White ning Day Cream	White ning Night Cream	Lumin ous Serum	Radia nce Gold Gel	Fac ial Wash
1	Maret	882	604	490	427	30
2	April	932	547	572	413	39
3	Mei	847	512	583	464	29
4	Juni	903	528	598	414	21
5	Juli	912	564	511	472	24
6	Agustus	874	613	507	417	33
7	September	839	622	541	457	32
8	Oktober	917	659	558	452	41
9	November	994	653	553	459	39
10	Desember	932	687	521	393	23
11	Januari	821	622	533	437	21
12	Februari	982	601	507	513	25

Table 1. MS Glow Mabella Store Cosmetics Sales Data Range

The problem that occurs in MS Glow Mabella Store Kisaran is the difficulty in determining the number of cosmetic products that must be available for the next month so that they can still meet customer needs and do not cause accumulation of goods in the long term. With a fairly tight business competition, MS Glow Mabella Store Kisaran must take into account the estimated number of cosmetic products to be purchased based on previous sales data, these predictions greatly affect the





decision to determine the number of products to be provided by MS Glow Mabella Store Range for the next sales period data[4]. Having an adequate supply of cosmetics according to customer demand is a very important factor to maintain business continuity at the MS Glow Mabella Store Kisaran.

Based on the existing problems, a sales strategy is needed, one of which is to predict or forecast sales on the supply of cosmetic products at the MS Glow Mabella Store Kisaran to make it easier to meet the needs of customer demand in the future[5]. Forecasting is a technique to identify a model that can be used to predict conditions in the future[6].

The method that can be used in this research is a quantitative forecasting method which is a forecast based on quantitative data or various mathematical models with past data. In the quantitative forecasting method there is one time series method which is a method based on the time variable[7][8]. One type of time series method in forecasting is the Weighted Moving Average (WMA) method, which is a method that gives different weights to each available historical past, assuming that the most recent or most recent historical data will have a greater weight than historical data. the old data because the most recent or new data is the most relevant data for forecasting. Another advantage of this method is that the weight value can be adjusted[9].

RESEARCH METHODS

The research method is a systematic or stage for conducting a research. To conduct a research, a research method is

needed where the research method is a technique or method used by the researcher in obtaining and solving a problem. In research methods there are types of research methods used to conduct a study. In this study, researchers used quantitative methods.

Quantitative methods use various mathematical models that rely on historical data or associative variables to forecast demand. So that researchers use quantitative methods because in this study there is a calculation method used in forecasting, where data processing is done by calculation[10].

To use the quantitative method there are three conditions that must be met, namely:

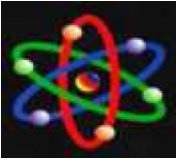
1. Information about the numeric past is available
2. The information can be quantified in the form of
3. It is assumed that some past patterns will continue

RESULTS AND DISCUSSION

Analysis of the current system is a system that learns how to conduct research and observations of work units in the sales process at MS Glow Mabella Store Kisaran. This aims to clearly know how the process of forecasting the amount of cosmetic inventory is running and evaluating any obstacles and problems that occur as well as the needs desired by MS Glow Mabella Store Kisaran so as to get a new system development.

From the results of the direct interview process to the owner of MS Glow Mabella





Store Kisaran, it is found that the current system is a prediction of the amount of cosmetic inventory that is still less effective and efficient. This happens because the cosmetic inventory system is still done manually. In the predictions made by MS Glow Mabella Store, there are still errors in planning and decision making in the future.

The ongoing cosmetic inventory system in MS Glow Mabella Store The range can be described in detail as follows:

1. Employees record sales data for 1 month how many cosmetic products at the MS Glow Mabella Store Kisaran that have been sold then the employee makes 2 copies of sales reports, 1 copy is to be archived and 1 copy is given to the owner of MS Glow Mabella Store Kisaran.
2. The owner receives a sales report and then analyzes the report how many products must be ordered for stock the next month then the owner of MS Glow Mabella Store Kisaran makes an order form / order form and then gives it to employees.
3. Employees receive an order form / product order form from the owner of MS Glow Mabella Store Kisaran and then the employee places an order with the distributor.
4. From the distributors, cosmetic products that have been ordered by employees will be sent.
5. After cosmetic products arrive, employees record and check the number of incoming cosmetic products.
6. Then the employee makes 2 copies of incoming goods receipt reports, 1 copy is

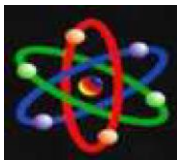
archived and 1 copy is given to the owner of MS Glow Mabella Store Kisaran.

Judging from the flow of the system that is currently running, that researchers found deficiencies in the system. The deficiency is found in the process of estimating the inventory of cosmetic products that must be provided for the next month which is done manually by looking at the condition of the number of goods sold and the remaining stock. According to the researcher, this is considered less effective in determining the amount of cosmetic product inventory contained in the MS Glow Mabella Store Range because in the ordering process there can also be stock accumulation because it cannot predict the goods sold in the following month. By using the new system analysis, it is expected to accelerate the data search process, so that the performance of activities at the MS Glow Mabella Store Kisaran can be more optimal. With the information system, it can save the use of paper, which was originally stored manually, was transferred to a computerized database in database storage. The system can simplify the process of making reports. Minimize the accumulation of goods. Prepare order data according to customer requests.

Analysis of data needs in this study takes data on sales of cosmetic products from MS Glow Mabella Store. The range is for 1 year, starting from June 2021 to May 2022. Sales data for cosmetic product brands are as follows:

1. Whitening Day Cream
2. Whitening Night Cream
3. Luminous Serum
4. Radiance Gold Gel





5. Facial Wash

NO	COSMETIC BRAND	SALES DATA	MONTH
1	Whitening Day Cream	882	Juni 2021
2	Whitening Night Cream	604	
3	Luminous Serum	490	
4	Radiance Gold Gel	427	
5	Facial Wash	30	

Table 2. Cosmetic Sales Data at MS Glow Mabella Store Range

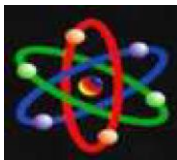
6	Whitening Day Cream	932	Juli 2021
7	Whitening Night Cream	547	
8	Luminous Serum	572	
9	Radiance Gold Gel	413	
10	Facial Wash	39	
11	Whitening Day Cream	847	Agustus 2021
12	Whitening Night Cream	512	
13	Luminous Serum	583	
14	Radiance Gold Gel	464	
15	Facial Wash	29	
16	Whitening Day Cream	903	September 2021
17	Whitening Night Cream	528	
18	Luminous Serum	598	
19	Radiance Gold Gel	414	
20	Facial Wash	21	
21	Whitening Day Cream	912	Oktober 2021
22	Whitening Night Cream	564	

23	Luminous Serum	511	November 2021
24	Radiance Gold Gel	472	
25	Facial Wash	24	
26	Whitening Day Cream	874	
27	Whitening Night Cream	613	
28	Luminous Serum	507	Desember 2021
29	Radiance Gold Gel	417	
30	Facial Wash	33	
31	Whitening Day Cream	839	
32	Whitening Night Cream	622	
33	Luminous Serum	541	Desember 2021
34	Radiance Gold Gel	457	
35	Facial Wash	32	

Table 3. Cosmetic Sales Data At MS Glow Mabella Store Advanced Range

36	Whitening Day Cream	917	Januari 2021
37	Whitening Night Cream	659	
38	Luminous Serum	558	
39	Radiance Gold Gel	452	
40	Facial Wash	41	
41	Whitening Day Cream	994	Februari 2021
42	Whitening Night Cream	653	
43	Luminous Serum	553	
44	Radiance Gold Gel	459	
45	Facial Wash	39	
46	Whitening Day Cream	932	Maret 2021
47	Whitening Night Cream	687	
48	Luminous Serum	521	
49	Radiance Gold Gel	393	





50	Facial Wash	23	
51	Whitening Day Cream	821	
52	Whitening Night Cream	622	
53	Luminous Serum	533	April 2021
54	Radiance Gold Gel	437	
55	Facial Wash	21	
56	Whitening Day Cream	982	
57	Whitening Night Cream	601	
58	Luminous Serum	507	Mei 2021
59	Radiance Gold Gel	513	
60	Facial Wash	25	

Table 4. Cosmetic Sales Data At MS Glow Mabella Store Advanced Range (2)

In the calculation using the WMA (Weighted Moving Average) method, it is necessary to determine how much weight is used. The amount of weight used in the system can be determined by searching the forecast error value and comparing it, the weight that will be compared in this calculation is the weight of 2,3,4,5 according to the latest/latest historical data to compare the smallest error value among 4 the existing weights are relevant data used as predictions/forecasting.

The following is the calculation of cosmetic inventory forecasting at the MS Glow Mabella Store Range using the WMA (Weighted Moving Average) method:

Forecasting Whitening Day Cream cosmetic supplies

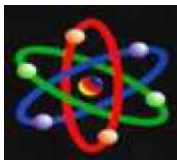
Juni 2021	=	882
Juli 2021	=	932
Agustus 2021	=	$((932*2)+(882*1))/(2+1)$
	=	915,33 = 915

September 2021	=	$((847*2)+(932*1))/(2+1)$
	=	875,33 = 875
Oktober 2021	=	$((903*2)+(847*1))/(2+1)$
	=	884,33 = 884
November 2021	=	$((912*2)+(903*1))/(2+1)$
	=	909,00 = 909
Desember 2021	=	$((874*2)+(912*1))/(2+1)$
	=	886,67 = 887
Januari 2022	=	$((839*2)+(874*1))/(2+1)$
	=	850,67 = 851
Februari 2022	=	$((917*2)+(839*1))/(2+1)$
	=	891,00 = 891
Maret 2022	=	$((994*2)+(917*1))/(2+1)$
	=	968,33 = 968
April 2022	=	$((932*2)+(994*1))/(2+1)$
	=	952,67 = 953
Mei 2022	=	$((821*2)+(932*1))/(2+1)$
	=	858,00 = 858

Forecasting calculations with 3 weights

Juni 2021	=	882
Juli 2021	=	932
Agustus 2021	=	847
September 2021	=	$((847*3)+(932*2)+(882*1))/(3+2+1)$
	=	881,17 = 881
Oktober 2021	=	$((903*3)+(847*2)+(932*1))/(3+2+1)$
	=	889,17 = 889
November 2021	=	$((912*3)+(903*2)+(847*1))/(3+2+1)$
	=	898,17 = 898
Desember 2021	=	$((874*3)+(912*2)+(903*1))/(3+2+1)$
	=	891,50 = 892
Januari 2022	=	$((839*3)+(874*2)+(912*1))/(3+2+1)$
	=	862,83 = 863
Februari 2022	=	$((917*3)+(839*2)+(874*1))/(3+2+1)$
	=	883,83 = 884
Maret 2022	=	$((994*3)+(917*2)+(839*1))/(3+2+1)$
	=	942,50 = 943
April 2022	=	$((932*3)+(994*2)+(917*1))/(3+2+1)$
	=	950,17 = 950
Mei 2022	=	$((821*3)+(932*2)+(994*1))/(3+2+1)$
	=	886,83 = 887





$$= 872,00 = 872$$

Forecasting calculations with 4 weights

Juni 2021 = 882

Juli 2021 = 932

Agustus 2021 = 847

September 2021 = 903

Oktober 2021 = $\frac{((903*4)+(847*3)+(932*2)+(882*1))}{(4+3+2+1)}$
 = 889,90 = 890

November 2021 = $\frac{((912*4)+(903*3)+(847*2)+(932*1))}{(4+3+2+1)}$
 = 898,30 = 898

Desember 2021 = $\frac{((874*4)+(912*3)+(903*2)+(847*1))}{(4+3+2+1)}$
 = 888,50 = 889

Januari 2022 = $\frac{((839*4)+(874*3)+(912*2)+(903*1))}{(4+3+2+1)}$
 = 870,50 = 871

Februari 2022 = $\frac{((917*4)+(839*3)+(874*2)+(912*1))}{(4+3+2+1)}$
 = 884,50 = 885

Maret 2022 = $\frac{((994*4)+(917*3)+(839*2)+(874*1))}{(4+3+2+1)}$
 = 927,90 = 928

April 2022 = $\frac{((932*4)+(994*3)+(917*2)+(839*1))}{(4+3+2+1)}$
 = 938,30 = 938

Mei 2022 = $\frac{((821*4)+(932*3)+(994*2)+(917*1))}{(4+3+2+1)}$
 = 898,50 = 899

Forecasting calculations with 5 weights

Juni 2021 = 882

Juli 2021 = 932

Agustus 2021 = 847

September 2021 = 903

Oktober 2021 = 912

November 2021 = $\frac{((912*5)+(903*4)+(847*3)+(932*2)+(882*1))}{(5+4+3+2+1)}$
 = 897,27 = 897

Desember 2021 = $\frac{((874*5)+(912*4)+(903*3)+(847*2)+(932*1))}{(5+4+3+2+1)}$
 = 890,20 = 890

Januari 2022 = $\frac{((839*5)+(874*4)+(912*3)+(903*2)+(847*1))}{(5+4+3+2+1)}$

Februari 2022 = $\frac{((917*5)+(839*4)+(874*3)+(912*2)+(903*1))}{(5+4+3+2+1)}$
 = 886,00 = 886

Maret 2022 = $\frac{((994*5)+(917*4)+(839*3)+(874*2)+(912*1))}{(5+4+3+2+1)}$
 = 921,00 = 921

April 2022 = $\frac{((932*5)+(994*4)+(917*3)+(839*2)+(874*1))}{(5+4+3+2+1)}$
 = 929,27 = 929

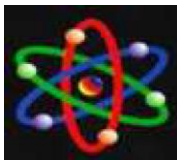
Mei 2022 = $\frac{((821*5)+(932*4)+(994*3)+(917*2)+(839*1))}{(5+4+3+2+1)}$
 = 899,20 = 899

It is done for other cosmetics in the same way. The recapitulation of forecasting results can be seen in the following table:

N O	YEA RS	MONT H	SAL ES DAT A	WM A	WM A	WM A	WM A
				2 Bob ot	3 Bob ot	4 Bob ot	5 Bob ot
1	2021	Juni	882	-	-	-	-
2	2021	Juli	932	-	-	-	-
3	2021	Agustus	847	915	-	-	-
4	2021	September	903	875	881	-	-
5	2021	Oktober	912	884	889	890	-
6	2021	November	874	909	898	898	897
7	2021	Desember	839	887	892	889	890
8	2022	Januari	917	851	863	871	872
9	2022	Februari	994	891	884	885	886
10	2022	Maret	932	968	943	928	921
11	2022	April	821	953	950	938	929
12	2022	Mei	982	858	887	899	899

Table 5. Forecasting Results of Whitening Day Cream Cosmetic Inventory





N O	YEA RS	MONT H	SAL ES DAT A	WM A 2 Bob ot	WM A 3 Bob ot	WM A 4 Bob ot	WM A 5 Bob ot
1	2021	Juni	604	-	-	-	-
2	2021	Juli	547	-	-	-	-
3	2021	Agustu s	512	566	-	-	-
4	2021	Septem ber	528	524	539	-	-
5	2021	Oktober	564	523	526	534, 60	-
6	2021	Novem ber	613	552	543	541, 10	544, 40
7	2021	Desem ber	622	597	583	571, 20	565, 07
8	2022	Januari	659	619	609	598, 30	588, 13
9	2022	Februa ri	653	647	639	629, 20	618, 53
10	2022	Maret	687	655	650	644, 60	637, 13
11	2022	April	622	676	671	664, 70	658, 73
12	2022	Mei	601	644	649	651, 40	650, 47

Table 6. Forecasting Results of Whitening Night Cream Cosmetic Inventory

N O	YEA RS	MONT H	SAL ES DAT A	WM A 2 Bob ot	WM A 3 Bob ot	WM A 4 Bob ot	WM A 5 Bob ot
1	2021	Juni	490	-	-	-	-
2	2021	Juli	572	-	-	-	-
3	2021	Agustu s	583	544, 67	-	-	-
4	2021	Septem ber	598	579, 33	563, 83	-	-
5	2021	Oktober	511	593, 00	588, 67	578	-
6	2021	Novem ber	507	540, 00	552, 00	558	555
7	2021	Desem ber	541	508, 33	523, 50	534	541
8	2022	Januari	558	529, 67	524, 67	531	536
9	2022	Februa ri	553	552, 33	543, 83	538	540
10	2022	Maret	521	554, 67	552, 67	548	543

11	2022	April	533	531, 67	537, 83	540	539
12	2022	Mei	507	529, 00	532, 33	536	538

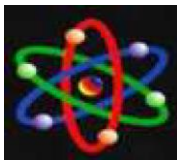
Table 7. Luminous Serum Cosmetic Inventory Forecasting Results

N O	YEA RS	MONT H	SAL ES DAT A	WM A 2 Bob ot	WM A 3 Bob ot	WM A 4 Bob ot	WM A 5 Bob ot
1	2021	Juni	427	-	-	-	-
2	2021	Juli	413	-	-	-	-
3	2021	Agustu s	464	418	-	-	-
4	2021	Septem ber	414	447	441	-	-
5	2021	Oktober	472	431	431	430	-
6	2021	Novem ber	417	453	451	447	444
7	2021	Desem ber	457	435	435	438	437
8	2022	Januari	452	444	446	444	444
9	2022	Februar i	459	454	448	449	446
10	2022	Maret	393	457	456	452	452
11	2022	April	437	415	425	431	433
12	2022	Mei	513	422	426	430	433

Table 8. Radiance Gold Gel Cosmetic Inventory Results Forecasting

N O	YEA RS	MONT H	SAL ES DAT A	WM A 2 Bob ot	WM A 3 Bob ot	WM A 4 Bob ot	WM A 5 Bob ot
1	2021	Juni	30	-	-	-	-
2	2021	Juli	39	-	-	-	-
3	2021	Agustu s	29	36	-	-	-
4	2021	Septem ber	21	32	33	-	-
5	2021	Oktober	24	24	27	28	-





6	2021	Novem ber	33	23	24	26	27
7	2021	Desem ber	32	30	28	28	28
8	2022	Januari	41	32	31	30	29
9	2022	Februar i	39	38	37	35	33
10	2022	Maret	23	40	39	38	36
11	2022	April	21	28	31	32	33
12	2022	Mei	25	22	25	27	29

Table 9. Forecasting Results for Facial Wash Cosmetics

In this study, the error calculation used by the MAD and MSE methods is a measure of forecasting accuracy in predicting the level of difference between the results of the request and what actually happened. Systematically, MAD and MSE can be formulated as follows:

$$MAD = \frac{\sum |At - Ft|}{n}$$

Where :

At : Actual demand in period t

Ft : Forecasting demand in period t

n : Number of forecasting periods involved

$$MSE = \sum Et^2 / n$$

Information :

Et2 : Squared error value

n: Lots of data

a. Calculation of MAD and MSE Error Values with 2 Cosmetic Weights Whitening Day Cream

MAD = = 66.77

MSE = = 5873.88

Of the two calculation error values used, namely MAD and MSE, the smallest error value is the more accurate value if used in a forecast. The smaller the error value, the better the forecast. Then the MAD error

value is used in this forecast to predict the amount of cosmetic inventory for the next month because the MAD value is smaller than the MSE value.

The results of the calculation of cosmetic inventory forecasting in June 2022 using the 2 Weighted Moving Average method. The weight is 928.33 with an error value of MAD 66.77. Here's the forecast calculation for June 2022:

$$WMA = 928.33 + 66.77$$

$$\text{Highest value} = 928.33 + 66.77 = 995.10 = 995$$

$$\text{The lowest value} = 928.33 - 66.77 = 861.57 = 862$$

The forecast results for June 2022 are between **862** to **995**. If the sales results that occur later exceed or are less than the predetermined value from the forecast, the forecast results are declared incorrect. However, if the sales results that occur later are between the values of 862 to 995, the forecast results used are good. So, MS Glow Mabella Store Kisaran can stock up on cosmetics in June 2022 as many as 928 items. The following is a recapitulation of the MAD error values of each cosmetic brand and their weights, namely 2,3,4,5 the smallest error value is used as a recommendation for a forecast because the smallest error value the greater the level of accuracy in prediction

EROR MAD					
Bobot / Merek Kosmet ik	Whiteni ng Day Cream	Whiteni ng Night Cream	Lumino us Serum	Radian ce Gold Gel	Faci al Wash
2 Bobot	66,77	36,07	29,07	36,80	6,77
3 Bobot	57,83	39,56	30,96	33,81	7,31
4 Bobot	57,10	46,51	28,63	32,35	7,41
5 Bobot	61,36	52,42	20,28	30,13	8,08

Table 10. MAD . Error Value Recapitulation





CONCLUSION

The system created can predict the amount of cosmetic inventory that MS Glow Mabella Store has to prepare for the following month. The method used, namely the Weighted Moving Average, can help MS Glow Mabella Store Kisaran in forecasting the number of sales of cosmetic products and cosmetic supplies for the following month.

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