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# Decision Support System for Digital Business Optimization: A Comparative Analysis of Sales Forecasting Using the Moving Average Method

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**ABSTRACT**

This research aims to analyze and compare the accuracy of sales prediction fore-casting methods using three types of Moving Average (MA), namely Simple Moving Average (SMA), Weighted Moving Average (WMA), and Trend Semi Average in the context of digital business optimization. The MA method is used to identify sales trends and assist in planning more effective business strategies. The data used in this research is historical sales data from digital business companies during a certain period. Each MA method is applied to the data to produce sales predictions. The accuracy of each method was evaluated using Mean Absolute Percentage Error (MAPE) as the main metric. This research provides an important contribution for companies in choosing the most appropriate forecasting method to increase operational efficiency and effectiveness. Recommendations resulting from this research can help companies optimize sales strategies and manage inventory better, to increase competitiveness in the market.

**Keywords:** forecasting, moving average, trend semiaverage, weighted moving average.

## 1. INTRODUCTION

In the current era of digital transformation, which continues to develop rapidly, it will change the way consumers interact and shop. To be able to compete effectively, digital companies need to have a strong strategy to manage their business. One important aspect of business management is the ability to predict sales accurately. Reliable sales predictions enable companies to optimize inventory, manage budgets and plan effective marketing strategies.

This garment company focuses on certain types of clothing, such as casual clothing, sportswear, uniforms, or formal clothing, as well as various other textile products. Characteristics of garment companies work with a variety of textile materials, such as cotton, polyester, silk, wool, and other synthetic materials. The initial stage of the production process is where clothing models or textile products are designed. Cutting means cutting fabric according to a design pattern to form parts of clothing. Stitching is the process of combining fabric parts to form the final product. Finishing includes adding details, washing, ironing, and packing.

In meeting the demand for garment products, companies with forecasting results, management can decide on the right policy in making decisions related to the company.

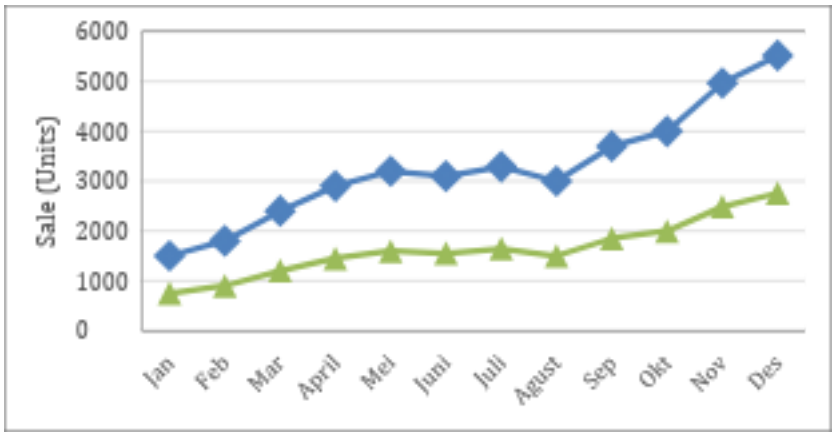


**Figure 1.** Sales Diagram Company

Forecasting methods or sales forecasting play an important role in helping businesses understand future trends based on historical data. The moving average (MA) method is one of the popular techniques used in sales data analysis (Putramasi Hintarsyah et al., 2018).

There are several uses of technology to support forecasting at company X using mathematical methods, namely Moving Average & Trend Semi Average. Moving Average is a method of forecasting value alignment by taking a group of observed values and then finding the average, then using the average as a forecast for the next period. The term moving average is used because every time new observational data becomes available, a new average figure is calculated and used as a forecast. Trend Semi Average can be used for forecasting purposes by forming an equation such as regression analysis(Irawan et al., 2021). The semi average method can be used with even or odd amounts of data. The trend equation obtained using a semi average can not only be used to determine the trend in the value of a variable from time to time but can also be used to predict the value of a variable at a certain time (Patandean et al., 2019).

The importance of sales predictions in a company, in fact, by understanding sales patterns and trends, businesses can plan more targeted marketing, increase promotional effectiveness, and maximize return on investment from marketing activities.

From the background that has been created, the problem formulation can be described as follows what is the behavior and sales scheme based on the amount of production in the company. In determining production targets for the coming year, how can company X identify forecasting based on sales in the previous year? What are the forecasting results obtained when using the Moving Average and Trend Semi Average methods.

This research aims to analyze and compare the effectiveness of the moving average method in predicting sales at a company (Zahri, 2018). The main goal of production forecasting is to ensure that the company can meet customer demand without experiencing excess or shortage of inventory (Adiningsih et al., 2023).

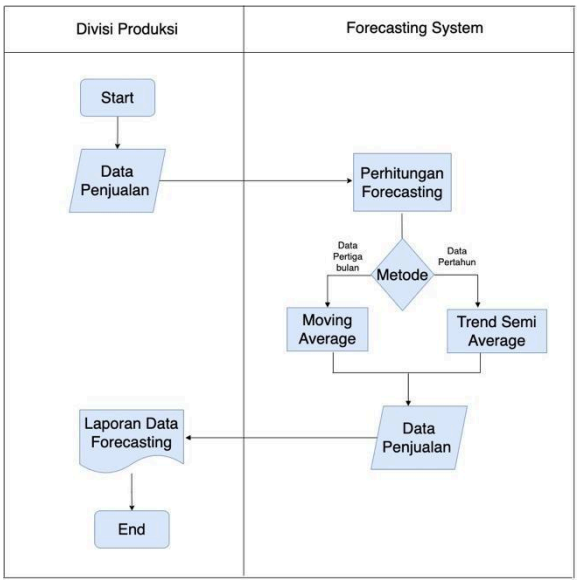


**Figure 2**. Flowchart Forecast

Comparative Analysis Study of Sales Projections Using the Moving Average Method in Digital Business Optimization is an analysis method applied to predict future data based on existing data. This moving average method functions by calculating the average of the values of several previous periods to predict the values for the next period. The research design steps taken include determining the research objective, namely, to forecast sales, demand, production, or other variables (Eko siswanto et al., 2021).

There is the first type of forecasting method, short-term forecasting, namely a period of less than 3 months, for example planning, purchasing materials, work scheduling and employee assignments. Second, medium term forecasting, namely a period of between 3 to 18 months, for example forecasting for sales planning, production planning and non-permanent workforce planning. All three long-term forecasts cover greater than 18 months (Rachman, 2018). For example, capital investment planning, facilities planning and planning for R&D.

## 2. LITERATURE REVIEW

Influence of the product life cycle. Another factor that must be considered when making sales forecasts, especially long-term sales forecasting, is the product life cycle, where sales of products and services do not occur at a constant level throughout their life, in fact almost all products successfully go through four stages, namely introduction, growth, maturity and decline (Yudaruddin, 2019).

Benefits and Uses of Moving Average Trend Identification Helps in identifying long-term trends by averaging short-term fluctuations in data. Noise Reduction: Reduces the “noise” in time series data that is often caused by random fluctuations. Prediction and Forecasting: Used in forecasting to predict future values based on historical trends. Technical Analysis in Finance in technical analysis, moving averages are used to identify buy or sell signals based on price movements. Advantages and Disadvantages of Moving Averages. The simple and easy to understand advantage of moving averages is that they are easy to calculate and implement. effective for data with clear trends effective in averaging data and identifying underlying trends (Anjani et al., 2022).

Moving Averages are ideal for companies that need to adjust short-term strategies based on seasonal changes or rapidly changing data patterns. Trend Semi Average is more suitable for long-term trend analysis that helps companies in strategic planning, such as expansion or capacity adjustments based on consistent growth predictions(Azahra et al., 2022). Forecasting is an important decision in a company where the company can determine the level of production that

needs to be prepared for the future. Determining the level of production is a supply that is influenced by the amount of market demand that the company can influence (Dua, 2021).

To help achieve an optimal decision, appropriate, systematic, and accountable methods are needed. One of the tools needed by management and an integral part of the decision-making process is the forecasting method.

## 3. RESEARCH METHOD

Moving Average (MA) is a statistical method used to analyze time data (time series) with the aim of identifying long-term trends and smoothing short-term fluctuations in the data (9). Moving Average calculates the average of a particular subset of data in a data series, thereby helping to reduce the effects of random variation and making underlying trends more visible (10). The moving average method is an analysis technique used to even out data fluctuations to identify clearer trends. This technique is often used in time series analysis and forecasting.

Moving Average (MA) is a statistical method used to analyze data in the form of a time series. This method averages data by calculating the average of a certain number of data points and moving from one point to the next in the time series. There are several types of moving averages that are commonly used. There are several types of Moving Averages that are often used in data analysis and forecasting:

$$MA = \frac{Xt-1+Xt-2+Xt-3}{n} \ldots(1)$$

Where:
n= number of periods in the moving average
t= demand for period i
X= data value

Moving average data is usually interpreted as follows uptrend if the moving average tends to increase, this indicates an upward trend in the original data, Downtrend if the moving average tends to decrease, this indicates a downward trend in the original data, Stable if the moving average moves horizontally, it means the original data does not show significant changes.

Weighted Moving Average (WMA) assign different weights to each period of data, with newer data usually given a higher weight.

$$WMAt = \frac{(X_t xW_3)+(X_{t-1} xW_2)+(X_{t-2} xW_1)}{w1+w2+w3} \ldots(2)$$

Where:
Xt = sales value for month t
w1, w2, w3 = weight of each month

Trend Semi Average is a technique in time series analysis that is used to estimate or determine the direction of data trends. This method involves dividing the data into two equal segments, then calculating the average of each segment to obtain a picture of the pattern.

$$b = \frac{Second\ average-first\ average}{Difference\ in\ years\ between\ groups} \ldots(3)$$

Calculate the intercept value (a) using one of the group midpoints. For example, let's take the midpoint of the first group with X=0 as the reference point for this year:

$$Y = a + bX$$

Benefits and Uses of Moving Average Trend Identification Helps in identifying long-term trends by averaging short-term fluctuations in data. Noise Reduction: Reduces the “noise” in time

series data that is often caused by random fluctuations. Prediction and Forecasting: Used in forecasting to predict future values based on historical trends. Technical Analysis in Finance: In technical analysis, moving averages are used to identify buy or sell signals based on price movements. Advantages and Disadvantages of Moving Averages. The simple and easy to understand advantage of moving averages is that they are easy to calculate and implement. effective for data with clear trends effective in averaging data and identifying underlying trends.

## 4. RESULTS AND ANALYSIS

Moving average (MA) helps minimize the effects of short-term fluctuations in the forecast.

Table 1 Moving Average

| Month | Sale (Unit) | Moving Average |
|---|---|---|
| Jan<br>Feb<br>Maret<br>April<br>Mei | 750<br>900<br>1200<br>1450<br>1600 | $MA\ Mei = \frac{750+900+1200+1450+1600}{4} = \frac{5950}{4} = 1.487,5$ |
| Jun | 1550 | $MA\ Juni = \frac{900+1200+1450+1600+1550}{4}$ $= \frac{6700}{4} = 1.675$ |
| Jul | 1645 | $MA\ Agustus = \frac{1450+1600+1550+1500}{4}$ $= \frac{7300}{4} = 1.825$ |
| Sep | 1500 | $MA\ September = \frac{1450+1600+1550+1850}{4}$ $= \frac{7000}{4} = 1.750$ |
| Okt | 2000 | $MA\ Oktober = \frac{1600+1550+1850+2000}{4}$ $= \frac{7650}{4} = 1.912,5$ |
| Nov | 2485 | $MA\ Oktober = \frac{1550+1850+2000+2485}{4}$ $= \frac{7885}{4} = 1.971,25$ |
| Des | 2760 | $MA\ Oktober = \frac{1850+2000+2485+2760}{4}$ $= \frac{9095}{4} = 2.273,75$ |

Based on the 4 Month Moving Average calculation, estimated sales for January next year are 2,274 units. The 4 Month Moving Average shows that product demand tends to increase over time.

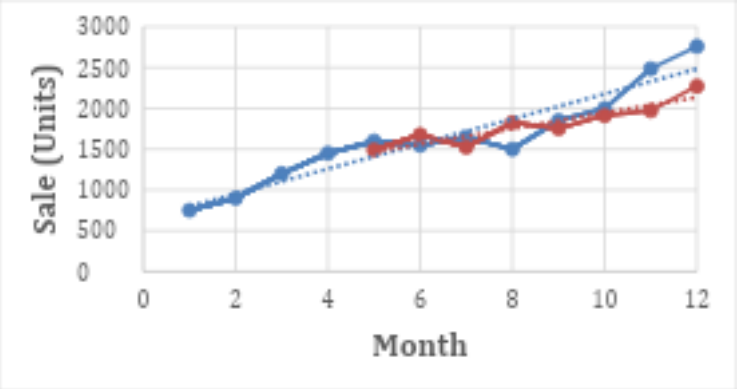


Figure 3. Moving Average

Figure 7. The company experienced a slow increase in sales throughout the year. By applying a 4-month period, any possible seasonal variations in sales have been smoothed out. This helps companies understand a more consistent long-term demand picture. Based on these findings, the company can prepare the right inventory or production to meet the estimated need of around 2,274 units in January next year. If the trend remains upward, companies may have to think about strategies to increase production or logistics capacity to meet the surge in demand in the coming months. Chart Analysis there is a visible improvement that there is an overall sales growth trend in the last few months. Softer changes in the moving average line help reduce the impact of significant monthly fluctuations, making the upward trend more obvious. Moving Averages like this are useful for managers to forecast trends in the following month and make more accurate inventory decisions.

Trend Semi Average is a trend analysis method used in time series analysis to predict gradual changes in data patterns over time. In this method, the data is divided into two equal parts, then the average of each part is calculated. This average value is then used to describe trends in the data, which makes it easier to identify the general direction of the data, whether it is increasing or decreasing. This method is simple but effective, especially when the data shows a consistent linear pattern or general trend. It is usually used to provide an initial picture of medium-term trends, making it suitable in business or economic analyzes that observe gradual changes in sales data, production, or other economic indicators.

Table 1. Trend Semi Average

| Years | Sale (Unit) | Trend Semi Average |
|---|---|---|
| 2016 | 1550 | Average data 1 (2016 – 2019) |
| 2017 | 2340 | $Average = \frac{1550+2340+2450+2100}{4} = \frac{8440}{4} = 2110$ |
| 2018 | 2450 | |
| 2019 | 2100 | |
| 2020 | 2500 | Average data 1 (2020 – 2023) |
| | | $Average = \frac{2500+2700+3000+3500}{4}$ |
| | | $= \frac{11.700}{4} = 2925$ |

Calculating Trend Slope, b:

The trend slope (b) is calculated by subtracting the second group mean from the first group mean, then dividing by the number of years between the two midpoints of the two groups (2 years in between):

$$b = \frac{Second\ average - first\ average}{Difference\ in\ years\ between\ groups}$$

$$b = \frac{2925-2110}{4} = \frac{815}{4} = 203,75$$

Slope b= 203.75

In 2017 (the midpoint of the first group), the average sales value was 2340
2340=a+203.75 x 0
Then a=2340
Equation Y=2340+203.75X
Sales Predictions for 2024:
For 2024, we calculate the value of X as the difference in years from the base year (2017).
X= 2024 – 2017 = 7
Y= 2340 + 203.75X
= 2340 + 203.75 (7)
= 2340 + 1426.25
= 3,766.25

Sales prediction results for 2024 using the Trend Semi Average method are 3,766.25 thousand units.

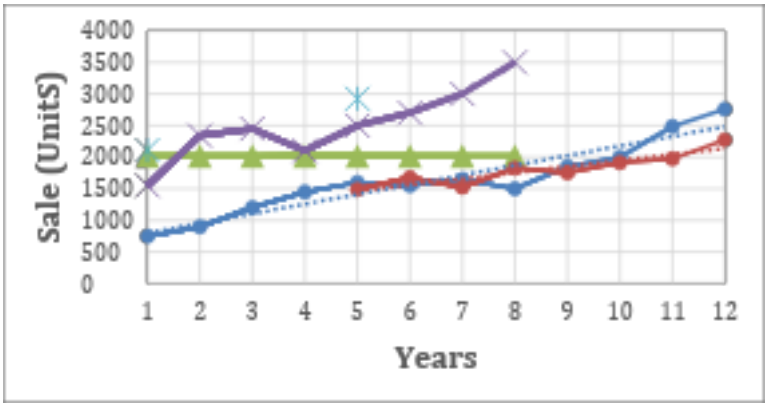


**Figure 4**. Trend Semi Average

Weighted Moving Average (WMA) is a data analysis technique that pays more attention to the most recent data when calculating the moving average, making it more responsive to recent changes in the data when compared to the Simple Moving Average (SMA). On the WMA, more recent information is rated as more relevant and has a greater impact on the mean than older information.

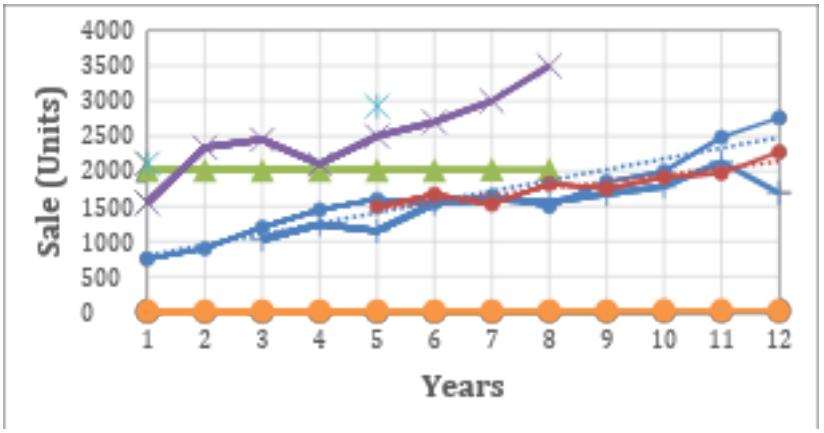


Figure 5. Weighted Moving Average (WMA)

This method is very suitable for application in time series data analysis, especially in sectors such as sales, production, finance, and stock exchanges.

Table 2.Weighted Moving Average (WMA)

| Month | Sale (Units) | Weighted Moving Average (WMA) |
|---|---|---|
| 1 | 750 | $WMAt = \frac{(750x1)+(900x2)+(1200x3)}{1+2+3}$ |
| 2 | 900 | |
| 3 | 1200 | $WMAt = \frac{750+1800+3600}{6} = \frac{6150}{6} = 1025$ |
| 4 | 1450 | $WMAt = \frac{(1450x4)+(1200x3)+(900x2)}{4+3+2}$ |
| | | $WMAt = \frac{5800+3600+1800}{9} WMAt = \frac{11200}{9} = 1244$ |
| 5 | 1600 | $WMAt = \frac{(1200x3)+(1450x4)+(1600x5)}{3+4+5}$ |
| | | $WMAt = \frac{3600+5800+8000}{12} WMAt = \frac{13000}{12} = 1150$ |
| 6 | 1550 | $WMAt = \frac{(1550x6)+(1600x5)+(1450x4)}{6+5+4}$ |
| | | $WMAt = \frac{9300+8000+5800}{15} WMAt = \frac{23100}{15} = 1540$ |
| 7 | 1645 | $WMAt = \frac{(1645x7)+(1550x6)+(1600x5)}{7+6+5}$ |
| | | $WMAt = \frac{11515+9300+8000}{18} WMAt = \frac{28815}{18} = 1600$ |
| 8 | 1500 | $WMAt = \frac{(1500x8)+(1645x7)+(1550x6)}{6+7+8}$ |
| | | $WMAt = \frac{12000+11515+9300}{21} WMAt = \frac{32815}{21} = 1562$ |
| 9 | 1850 | $WMAt = \frac{(1850x9)+(1500x8)+(1645x7)}{9+8+7}$ |
| | | $WMAt = \frac{16650+12000+11515}{24} WMAt = \frac{40165}{24} = 1673$ |
| 10 | 2000 | $WMAt = \frac{(2000x10)+(1850x9)+(1500x8)}{10+9+8}$ |
| | | $WMAt = \frac{20000+16650+11515}{27} WMAt = \frac{48165}{27} = 1783$ |
| 11 | 2485 | $WMAt = \frac{(2485x11)+(2000x10)+(1850x9)}{11+10+9}$ |
| | | $WMAt = \frac{27335+20000+16650}{30} WMAt = \frac{63985}{30} = 2132$ |
| 12 | 2760 | $WMAt = \frac{(2760x12)+(2485x11)+(2000x10)}{12+11+10}$ |
| | | $WMAt = \frac{33120+2760+20000}{33} WMAt = \frac{55880}{33} = 1693$ |

## 5. CONCLUSION

Moving Average calculates the average value over a certain time period by periodically replacing old data with new data. The goal is to smooth data fluctuations to identify long-term trends. Trend Average: Use historical data to identify long-term patterns (trends) in data. Typically utilize linear regression or similar methods to predict business direction.

Weighted Moving Average (WMA) This method gives greater weight to data that is considered more important or relevant. The weight can be adjusted based on importance or priority. The choice of method depends on the type of data, the purpose of the analysis, and the desired level of sensitivity to change. For a more stable and simple analysis, Moving Average is more suitable. If

you need a long-term view, use Trend Average. If you want to focus on a specific aspect of the data, Weighted Average provides greater flexibility. In business practice, a combination of methods is often used to obtain a more comprehensive analysis.

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**REFERENCES**

Adiningsih, M., Yulianti, D., & Wibowo, A. (2023). Analisis Penerapan Forecasting dalam Menentukan Kebutuhan Storage pada Pusat Data Kementerian Keuangan. *JRST (Jurnal Riset Sains Dan Teknologi)*, *7*(2). https://doi.org/10.30595/jrst.v7i2.17579

Anjani, I. G., Saputri, A. B., Armeira, A. N. P., & Januarita, D. (2022). Analisis Konsumsi Dan Produksi Minyak Kelapa Sawit Di Indonesia Dengan Menerapkan Metode Moving Average. *JURIKOM (Jurnal Riset Komputer)*, *9*(4). https://doi.org/10.30865/jurikom.v9i4.4506

Azahra, N., Alifia, S. C., Andyka, N. P., Wijayanto, S., & Fathoni, M. Y. (2022). Peramalan Jumlah Produksi Tebu Menggunakan Metode Time Series Model Moving Averages. *JURIKOM (Jurnal Riset Komputer)*, *9*(4). https://doi.org/10.30865/jurikom.v9i4.4388

Dua, A. (2021). *Forecasting: Metode Peramalan dalam Bisnis yang Wajib Diketahui*. Rusdionoconsulting.Com.

Eko siswanto, Eka Satria Wibawa, & Mustofa, Z. (2021). Implementasi Aplikasi Sistem Peramalan Persedian Barang Menggunakan Metode Single Moving Average Berbasis Web. *Elkom : Jurnal Elektronika Dan Komputer*, *14*(2), 224–233. https://doi.org/10.51903/elkom.v14i2.515

Irawan, F., Sumijan, S., & Yuhandri, Y. (2021). Prediksi Tingkat Produksi Buah Kelapa Sawit dengan Metode Single Moving Average. *Jurnal Informasi Dan Teknologi*. https://doi.org/10.37034/jidt.v3i4.162

Patandean, S., Askar, A., & Mashud, M. (2019). APLIKASI FORECASTING PENJUALAN MENGGUNAKAN METODE SEMI AVERAGE PADA TOKO RUMAH KITA MAKASSAR. *Inspiration: Jurnal Teknologi Informasi Dan Komunikasi*, *9*(1), 25. https://doi.org/10.35585/inspir.v9i1.2493

Putramasi Hintarsyah, A., Christy, J., & Leslie Hendric Spits Warnars, H. (2018). Forecasting Sebagai Decision Support Systems Aplikasi Dan Penerapannya Untuk Mendukung Proses Pengambilan Keputusan. *Jurnal Sistem Komputer*, *8*(1), 2252–3456.

Rachman, R. (2018). Penerapan Metode Moving Average Dan Exponential Smoothing Pada Peramalan Produksi Industri Garment. *Jurnal Informatika*, *5*(2). https://doi.org/10.31311/ji.v5i2.3309

Yudaruddin, R. (2019). FORECASTING: UNTUK KEGIATAN EKONOMI DAN BISNIS. In *Экономика Региона*.

Zahri, C. (2018). Analisis Pola Produksi Guna Meminimalisasi Biaya Produksi Pada PT. Gergas Utama Medan. *Warta Dharmawangsa*, *55*.