SALES FORECASTING FOR MIXUE ICE CREAM PRODUCTS USING THE TREND MOMENT METHOD

Fitra Dorica Tambunan[1], Anita[*], Julia Christin[3]
[1-3]Sains dan Teknologi, Sistem Informasi, Universitas Prima Indonesia, Medan, Indonesia
email: [1]tambunanfitra2209@gmail.com, [*]anita@unprimdn.ac.id, [3]juliachristin@gmail.com

Abstract

Sales of consumen products often experience fluctuations each period, so proper sales planning is required to ensure that the company's operational activities run smoothly. The problem that arises is the absence of a forecasting model that is easy to use but capable of producing accurate results. This study aims to develop a sales forecasting model using the Trend Moment method. This method is chosen because it is simple and can be used to identify the direction of trends based on previous sales data. This study utilizes monthly sales data collected over a one-year period. The Trend Moment method in this study successfully achieved a MAPE value of 1.8% and an accuracy rate of 98.2%. These values indicate that the model is sufficiently accurate in forecasting sales. The results of this model can assist the company in planning production, managing distribution, and controlling inventory. This study is also beneficial as a basis for developing simple forecasting models for similar products in the future.

Keywords*: Trend Moment; Forecasting; Time Series; Mixue; Ice Cream*

1. INTRODUCTION

Technology plays an increasingly important role with the times. Faster technological advances encourage business actors to make adjustments to stay ahead of the competition, through the implementation of an integrated strategy that includes estimating sales, increasing sales, and applying technology as a whole (Cruso, 2024). Currently, the majority of fast-growing and in-demand franchises in Indonesia come from the food and beverage sector, which accounts for about 56% of all registered and actively operating foreign franchises in Indonesia (Fitri Safira et al., 2024). Mixue, as an international beverage franchise, is currently intensively developing its operational scope in Indonesia.

Founded by Zhang Hongchao in 1997 in China, Mixue has grown into a franchise chain offering ice cream and cold drink products, and has managed to attract the attention of Indonesian consumers widely in recent years (Yulisetiarini et al., 2023). Currently, Mixue has operated more than 21,000 stores worldwide, including more than 1,000 stores spread across various regions of Indonesia. The company has been present in Indonesia since 2020 (Sewu et al., 2024). Since then, Mixue has been widely known and has become popular in the community.

Today's consumers tend to want products and brands that offer authenticity, memorable experiences, and services tailored to their personal preferences (Bartsch et al., 2022). Purchasing is an important activity carried out by a company or organization to meet inventory needs and ensure continuity of supply to customers (Firmansyah et al., 2021). Therefore, proper inventory management is essential, especially considering the level of inaccuracies in demand forecasting, so that companies can efficiently determine order timing and adjust stock availability to market dynamics (Zhou et al., 2023). In addition, the effectiveness of inventory management is also improved through the use of digital technologies in the supply chain system, such as the application of real-time data and intelligent analytics, which can increase information transparency and reduce the amount of inventory efficiently (Ali et al., 2024).

To improve the accuracy of forecasting material needs and inventory management, companies can implement forecasting methods such as Trend Moment, which have proven effective by combining classic statistical approaches and artificial intelligence-based algorithms, thus supporting more responsive and adaptive stock planning to demand dynamics (Wahedi et al., 2023). The Trend Moment method itself is a quantitative forecasting technique used to determine the direction and trend patterns of data in a certain

period of time through linear processing of historical data (Adeputra & Pratiwi, 2025). Trend lines are formed systematically and efficiently through a process of alternation between the actual data values and the adjusted time positions, which are then used to estimate the value in the coming period.

This study aims to implement the Trend Moment method as a forecasting approach that aims to improve the accuracy of material demand estimation in the inventory management system (Adam Suhaidi Batubara et al., 2022). By analyzing historical data and trend trend patterns, this method is expected to be able to provide flexible forecasting results for demand dynamics, so as to improve the quality of operational decision-making efficiently and sustainably. Furthermore, this research is aimed at making an applicative contribution in formulating a supply chain management strategy that is more adaptive and responsive to the needs of the food and beverage industry.

2. METHODOLOGY

2.1 Types of Research

The quantitative approach is a research method that emphasizes the collection and statistical analysis of numerical data to understand social, economic, or behavioral phenomena (Mweshi & Muhyila, 2024). This method uses numerical measurements, systematic research design, and hypothetical testing that can be measured empirically.

2.2 Population and Sample

This study focuses on ice cream sales data for the last 1 year and 4 months, which includes daily transactions, sales dates, and number of units sold. For the purpose of analysis, a random sample of 50% of the total transactions recorded was collected so that the data taken was representative and the research results were valid. This 50% sample selection was considered large enough to accurately depict sales patterns and trends, while improving efficiency in data processing given the considerable volume of transactions during the study period. The data collected includes the month, number of units sold, and total revenue in rupiah, which is then processed in table format.

Descriptive analysis is performed to calculate overall sales and monthly average figures, and Microsoft Excel is employed to create visual representations of the sales data, helping to reveal trends through (Shrikhande, 2024). The results of the analysis are expected to provide in-depth insights into consumer behavior as well as the factors that influence ice cream sales, which can be the basis for formulating more effective marketing strategies to improve sales performance and consumer appeal.

2.3 Research Procedure

A flowchart is a chart with specific symbols that describes the sequence of processes in detail and the relationship between one process and another process in a program (Tarsini & Anggraeni, 2024).
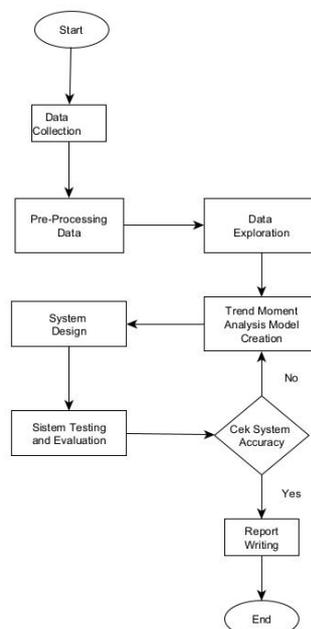

Fig 1. Research Flow Diagram

2.4 Data Collection

This study uses Mixue sales data for 1 year and 4 months, from June 2023 to September 2024, with a total sales of 9,972 cones. As shown in table 1.1.

Table 1. Sales Data of Ice Cream Mixue 16 Months

Moon	Total Sales	Total Price
June	188	1.504.000
July	1.450	11.600.000
August	749	5.992.000
October	757	6.056.000
September	866	6.928.000
November	773	6.184.000
December	650	5.200.000
January	528	4.224.000
February	643	5.144.000
March	482	3.856.000
April	631	5.048.000
May	554	4.432.000
June	411	3.288.000
July	499	3.992.000
August	386	3.088.000
September	450	3.240.000

2.5 Trend Moment Method

The Trend Moment method is a time series analysis technique that predicts future values by examining trend patterns in historical data (Iriyanti et al., 2022). This method utilizes previous sales data to help companies estimate the number of items to be sold as well as inventory needs in the following month (Khandhar, 2025).

With the formula :

$$Y = a + bX$$

With: Y= Sales forecast

a= Constant number

b= Trend line coefficient

X= Time or period (e.g. month or year)

Formula for calculating the values of a and b:

$$b = \frac{n(\sum XY) - (\sum X)(\sum Y)}{(\sum X^2) - (\sum X)^2}$$

$$a = \frac{\sum Y - b(\sum X)}{n}$$

With:

$\sum X$= The sum of the time period

$\sum Y$= The total amount of sales data

$\sum XY$= The total sum of the total time period multiplied by the number of sales

n= Amount of time (months)

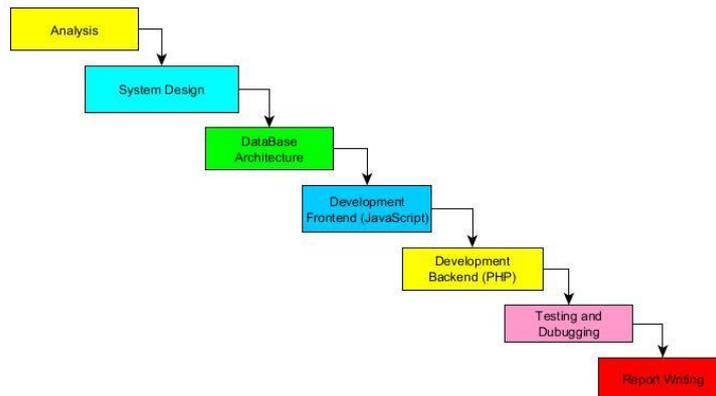## 2.6 System Design Methods

Fig 2. System Design Methods

The system design starts with gathering specifications derived from the analysis results to ensure the system operates efficiently and meets user requirements (O'Hare et al., 2020). An analysis was carried out on historical data of Mixue ice cream sales to identify seasonal patterns, trends, and external factors that influence sales. The results of the analysis are the basis for designing a prediction system using the Trend Moment method (Fauzan et al., 2023). The interface is designed to be responsive with simple navigation to make it easier for users to access the prediction results.

The database is designed to effectively handle sales data, predict results, and track trend parameters in real time. The frontend is developed using JavaScript to create an interactive interface and handle display updates (Fildes et al., 2022). The backend uses PHP to process data, calculate predictions, and communicate with databases and API (Permatahati & Muqorobin, 2022). Testing and debugging are carried out to ensure the functionality of the system, followed by documentation as a development reference.

3. RESULTS AND DISCUSSION

3.1 *Algorithm Method*

Previous research has used the Trend Moment method to analyze long-term trends in determining stock of goods. The results are used to predict the next month's sales (Nikulchev & Chervyakov, 2023). This method has a calculation step that guides future sales projections.
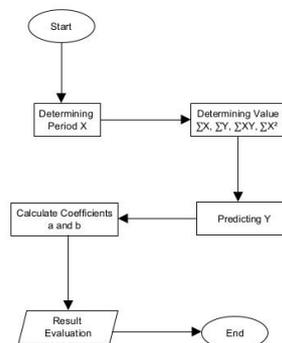

Fig 3. Trend Moment Method Flowchart

3.2 Implementation of Trend Moment Analysis

This study used 16 months of sales data (Table 1) to calculate the values of a and b on linear regression. The first step is to compile the data of variables X (time) and Y (Sales), then calculate X² and XY.

The total sums of $\sum X$, $\sum Y$, $\sum X^2$, and $\sum XY$ are used in the regression formula to determine a (intercept) and b (slope). The results of the calculation of the values of X, Y, X², and XY each month are presented in Table 2.

Table 2. Determining Time Values (X), Sales (Y) and X^2

Moon	Total Sales (Y)	Time (X)	X*Y	X^2
June	188	0	0	0
July	1.450	1	1.450	1
August	749	2	1.498	4
October	757	3	2.271	9
September	866	4	3.464	16
November	773	5	3.865	25
December	650	6	3.900	36
January	528	7	3.696	49
February	643	8	5.144	64
March	482	9	4.338	81
April	631	10	6.310	100
May	554	11	6.094	121
June	411	12	4.932	144
July	499	13	6.487	169
August	386	14	5.404	196
September	450	15	6.075	255
Sum	9.972	120	64.928	1.240

After the calculations for $\sum X = 120$, $\sum Y = 9,972$, $\sum X^2 = 1,240$, and $\sum XY = 64,928$ the next step is to calculate the coefficients b (slope) and a (intercept) to form a sales pattern model.

b=(16(64.928)-(120)(9.972))/((1.240)-(120)^2)

b=(1,038,848-1,196,640)/(1,240-14,400)

b=(- 157,792)/(-13,160)

b=11.99

By substituting the existing value, b= 11.99 is obtained and then calculates the value a.

a=(9,972-(11,99)(120))/16

a=(9,972-1,438.8)/16

a=8,533.2/16

a=533.32

After knowing the values of **a = 533.32** and **b = 11.99**, it can be predicted that the number of sales in the following month can be predicted. With an example of the prediction of the 17th month (November of the following year) is:

Y = 533.32 + (11.99)(17)

Y = 533.32 + 203.83

Y = 737.15

So sales in the 17th month were around 737 units.

Based on sales predictions generated through the application of the Trend Moment method, a number of strategies can be effectively implemented in the food and beverage business sector, including increasing efficiency in inventory management and adjusting promotional policies according to demand trends. In the aspect of inventory management, approaches such as Just in Time (JIT) and safety stock recalculation can be applied to prevent excess or understock. In the promotion aspect, predicting demand trends allows business actors to design more targeted marketing strategies, such as providing discounts when sales are expected to decline or implementing upselling strategies when demand is projected to increase. The forecasting results also play a role in the preparation of production and distribution schedules that are adaptive to market dynamics, which ultimately contributes to improving overall operational efficiency. Therefore, the integration between predicted results and operational strategies makes a real contribution to supporting data-driven business decision-making.

Calculating the MAPE (Mean Absolute Percentage Error) method will be used. The selection of this method is based on the consideration that MAPE is considered more accurate and easier to understand compared to other methods (Alzeyani & Szabó, 2024).

MAPE=(869.837-737.15)/737.15*100%

MAPE = 0.018 * 100 %

MAPE=1.8 %

Accuracy Rate = 100% - Error"

Accuracy Rate = 100% - (1.8%)"

Accuracy Rate = 98.2%

3.4 Implementation of web systems

The implementation phase is the stage at which the developed system is deployed and operated based on its intended design (Titis Sri Wulan et al., 2024). The following are the results of the implementation of the Ice Cream Mixue forecasting system through a web-based application.

3.4.1 Main Menu Display

This menu usually consists of a logo that represents the identity of the site. In addition, the main menu presents a number of horizontally arranged submenus, including a login menu that gives users access to view sales predictions.
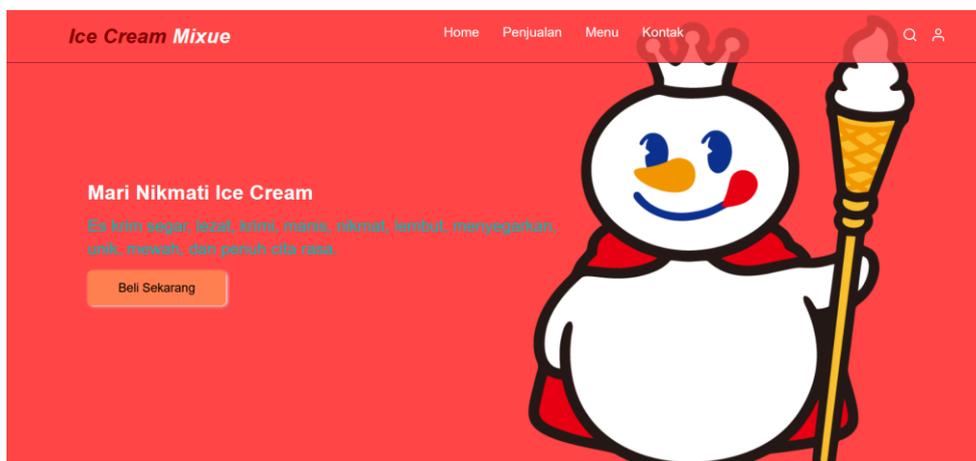

Fig 4. Main Menu View

3.4.2 Login Menu

The app's login page is designed to facilitate users in accessing their accounts through a simple and informative interface. On this page, there are fields to enter your email address and password, as well as a login button that serves to give you access to the application.
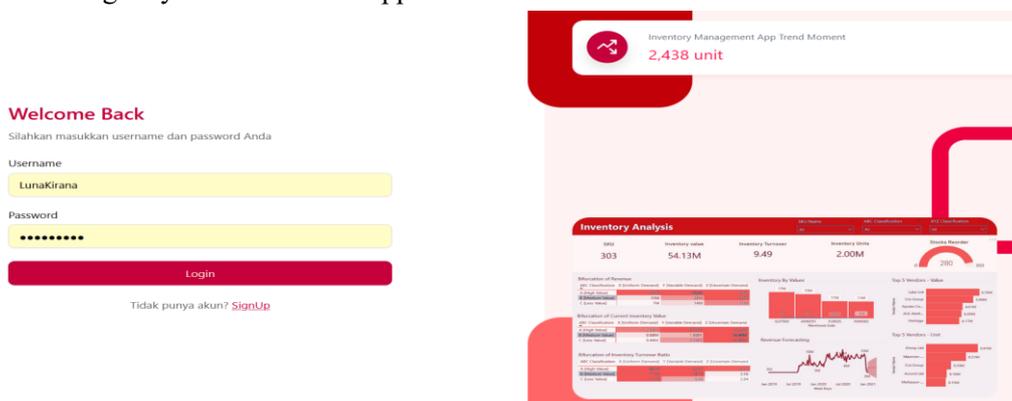

Fig 5. Prototype Menu Login

3.4.3 Dashboard Display

This dashboard display displays a summary of initial information, inventory to manage inventory data, sales that record all transactions, customers who store customer information, analytics to present data analysis and sales predictions.

Fig 6. Dashboard View

3.4.4 Trend Moment Analysis

This section features a visualization of Mixue's sales data in the form of a bar chart, which is designed to make it easier for users to analyze sales patterns and trends. The information in this diagram is obtained through the process of recording historical data which is then processed systematically. With the help of this chart, users can understand the projected sales in the upcoming period, including the estimated number of sales for the following month.
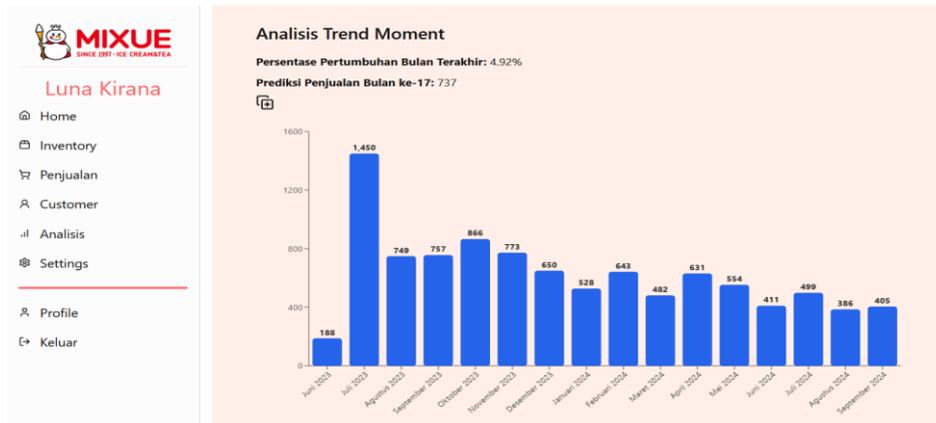

Fig 7. Trend Moment Analysis

3.4.5 Adding and Deleting Data

The display adds data is to input new data or delete incorrect data, in order to make a sales prediction for the user.

Fig 8. Adding and Deleting Data

4. CONCLUSION

Based on the results of the evaluation, the Trend Moment method proved to be effective in predicting Mixue ice cream sales in the next period, with a Mean Absolute Percentage Error (MAPE) value of 1,8% which indicates a very low level of prediction error. The advantage of this method lies in its ease of application as well as its ability to identify linear trends from historical data. However, the limitations of this method can be seen in its inability to capture seasonal patterns and non-linear fluctuations. Therefore, further development is recommended through the integration of machine learning methods, such as Random Forest or Long Short-Term Memory (LSTM), which are more adaptive to complex data patterns. In addition, the web-based sales prediction application that has been developed is considered to be able to facilitate users in obtaining sales forecast information quickly, accurately, and efficiently.

5. REFERENCE

Adam Suhaidi Batubara, A. S. B., Dafitri, H., & Faisal, I. (2022). Analysis of Linear Regression and Trend Moment Methods in Predicting Sales Using Mape. *Jurnal Sistem Informasi Dan Ilmu Komputer Prima(JUSIKOM PRIMA)*, *6*(1), 75–81. https://doi.org/10.34012/jurnalsisteminformasidanilmukomputer.v6i1.2919

Adeputra, J., & Pratiwi, H. (2025). *Optimization of Spareparts Stock Data Management at PT . Astra Motor Kaltim 2 using the Trend Moment Method*. *8*(158), 326–332.

Ali, A. A. A., Fayad, A. A. S., Alomair, A., & Al Naim, A. S. (2024). The Role of Digital Supply Chain on Inventory Management Effectiveness within Engineering Companies in Jordan. *Sustainability*, *16*(18), 8031. https://www.mdpi.com/2071-1050/16/18/8031

Alzeyani, E. M. M., & Szabó, C. (2024). Comparative Evaluation of Model Accuracy for Predicting Selected Attributes in Agile Project Management. *Mathematics*, *12*(16). https://doi.org/10.3390/math12162529

Bartsch, F., Zeugner-Roth, K. P., & Katsikeas, C. S. (2022). Consumer authenticity seeking: conceptualization, measurement, and contingent effects. *Journal of the Academy of Marketing Science*, *50*(2), 296–323. https://doi.org/10.1007/s11747-021-00813-y

Cruso, J. (2024). *Digital Transformation : Redefining Business in the Digital Age Abstract*. *2015*, 2015–2017. https://doi.org/10.36648/1550-7521.22.70.445

Fauzan, A., Rahayu, D. G., Handayani, A., Tahyudin, I., Saputra, D. I. S., & Purwadi, P. (2023). Sales Forecasting Analysis Using Trend Moment Method: A Study Case of a Fast Moving Consumer Goods Company in Indonesia. *Journal of Information Technology and Cyber Security*, *1*(1), 1–8. https://doi.org/10.30996/jitcs.7572

Fildes, R., Kolassa, S., & Ma, S. (2022). Post-script—Retail forecasting: Research and practice. *International Journal of Forecasting*, *38*(4), 1319–1324. https://doi.org/10.1016/j.ijforecast.2021.09.012

Firmansyah, R., Puspitorini, S., Pariyadi, P., & Syah, T. (2021). Sales and Stock Purchase Prediction System Using Trend Moment Method and FIS Tsukamoto. *Arcitech: Journal of Computer Science and Artificial Intelligence*, *1*(1), 15. https://doi.org/10.29240/arcitech.v1i1.3057

Fitri Safira, S., Rohman, F., & Aisjah, S. (2024). The Effect of Country of Origin and Price on Purchase Intention Mediated by Trust : A Study on Mixue Global Franchising Consumers in Malang City. *IRJEMS International Research Journal of Economics and Management Studies*, *3*(4), 325–332. https://doi.org/10.56472/25835238/IRJEMS-V3I4P142

Iriyanti, M. P., Kurniawati, A., & Widiastuti, W. (2022). Sales Stock Forecasting System Using Trend Moment Method (Study Case: Warcam Store). *Jurnal Teknik Informatika (Jutif)*, *3*(5), 1131–1140. https://doi.org/10.20884/1.jutif.2022.3.5.161

Khandhar, M. A. (2025). Sales Forecast and Inventory Management Using ML. *International Journal for Research in Applied Science and Engineering Technology*, *13*(1), 1982–1988. https://doi.org/10.22214/ijraset.2025.66732

Mweshi, G. K., & Muhyila, M. (2024). Determining a Statistical Analysis for the Quantitative Study in Research. *Advances in Social Sciences Research Journal*, *11*(7), 187–231. https://doi.org/10.14738/assrj.117.17018

Nikulchev, E., & Chervyakov, A. (2023). Development of Trading Strategies Using Time Series Based on Robust Interval Forecasts. *Computation*, *11*(5). https://doi.org/10.3390/computation11050099

O'Hare, J., Dekoninck, E., Mombeshora, M., Martens, P., Becattini, N., & Boujut, J. F. (2020). Defining requirements for an Augmented Reality system to overcome the challenges of creating and using design representations in co-design sessions. *CoDesign*, *16*(2), 111–134.

https://doi.org/10.1080/15710882.2018.1546319

Permatahati, I., & Muqorobin, M. (2022). Computer Sales Forecasting System Application Using Web-Based Single Moving Average Method. *International Journal of Computer and Information System (IJCIS)*, *3*(2), 56–63. https://doi.org/10.29040/ijcis.v3i2.68

Sewu, P. L. S., Tresnawati, & Rachelia, C. (2024). Legal Analysis of the Success of Mixue Franchise Schemes in Singapore, South Korea, and Japan Linked to the Success of Mixue Franchise Schemes in Indonesia and Vietnam. *European Journal of Law and Political Science*, *3*(2), 18–27. https://doi.org/10.24018/ejpolitics.2024.3.2.126

Shrikhande, P. (2024). *Sales Forecasting Methods : A Comparative Study with Excel-Based Analysis*. 1–11. https://doi.org/10.55041/IJSREM38171

Tarsini, I., & Anggraeni, R. (2024). Explore flowchart and pseudocode concepts in algorithms and programming. *Indonesian Journal of Multidisciplinary Science*, *3*(5). https://doi.org/10.55324/ijoms.v3i5.807

Titis Sri Wulan, Putri Wahyu Novika, Elmi Nurvianti, & Feby Arma Putra. (2024). Impact of ERP System Implementation on Operational and Financial Efficiency in Manufacturing Industry. *Journal of Economic Education and Entrepreneurship Studies*, *5*(3), 491–501. https://doi.org/10.62794/je3s.v5i3.4328

Wahedi, H. J., Heltoft, M., Christophersen, G. J., Severinsen, T., Saha, S., & Nielsen, I. E. (2023). Forecasting and Inventory Planning: An Empirical Investigation of Classical and Machine Learning Approaches for Svanehøj's Future Software Consolidation. *Applied Sciences (Switzerland)*, *13*(15), 1–21. https://doi.org/10.3390/app13158581

Yulisetiarini, D., Nurhayati, Tamara, A., & Subagio, A. (2023). The Effect of Brand Image And Trust on Loyalty Through Customer Satisfaction as an Intervening Variable at KFC in Jember. *Journal of Innovations in Business and Industry*, *03*(02), 111–116.

Zhou, Y., Shen, X., & Yu, Y. (2023). Inventory control strategy: based on demand forecast error. *Modern Supply Chain Research and Applications*, *5*(2), 74–101. https://doi.org/10.1108/mscra-02-2023-0009