

**SOUVENIR SALES FORECASTING ANALYSIS USING SUPPLY CHAIN
MANAGEMENT APPROACH
(CASE STUDY: SOUVENIR ORCHID SHOP)**

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Abstrak

Orchid Souvenir Shop is a business that provides various types of souvenirs and handicraft items. The purpose of the study is to forecast the stock of wedding souvenir products by empirically testing the facts or elements of the existence of supply chain management by analyzing industrial processes. Demand management activities need to be supported by the administration's systematic and easy demand forecasting process so that fast and accurate information can be obtained to support the MTO-based decision-making process (make-to-order). The demand forecasting method can reduce the risk of product obsolescence and unmet consumer needs and solve material supply problems. Decisions in supply chain management aim to reduce waste and optimize value for all components in the supply chain. Demand forecasting uses time series analysis with moving averages, exponential smoothing, and trend projection methods. To measure the accuracy of forecasting results, analysis using MSE, MAD, and MAPE is used.

Keywords: Demand forecasting, production planning and control, time series model, and supply chain management.

INTRODUCTION

The rapid development of information technology, communication, and manufacturing processes results in a short product life cycle. Therefore, every company will try to increase productivity, efficiency, fast, easy service, and create innovations to remain superior and survive in the market. The company must achieve excellence by producing good performance to stay in business competition. The goals of industrial enterprises, in general, are to achieve profitability (profitability), the pursuit of growth (growth), and the ability to survive (survive)

in business competition[1]. In achieving the company's goals, management must be able to make strategic decisions precisely. The decisions taken by the administration will significantly affect the company's condition, both in the short and long term. One of the efforts to maximize the company's profits is to manage the product supply chain well to achieve optimal customer satisfaction.

Orchid Souvenir Shop is a type of business that provides various kinds of souvenirs and handicraft items used as symbolic souvenir that is often given at an event or event. In this case, Orchid Souvenir Shop offers a variety of souvenirs for various kinds of events, Such as souvenirs for weddings. Gaining loyalty and trust in customers' hearts, the demand for wedding souvenir products always increases from multiple circles and marketing areas. Many customer requests for souvenir products are responded to quickly and maximize profits. It isn't easy to know if you will stock an Inventory of wedding souvenir products. Therefore, it is necessary to forecast product demand appropriately so there is no excess or lack of production. Demand Forecasting (demand forecasting) is an activity to estimate the amount of demand for specific goods or services in a particular marketing period and area [1].

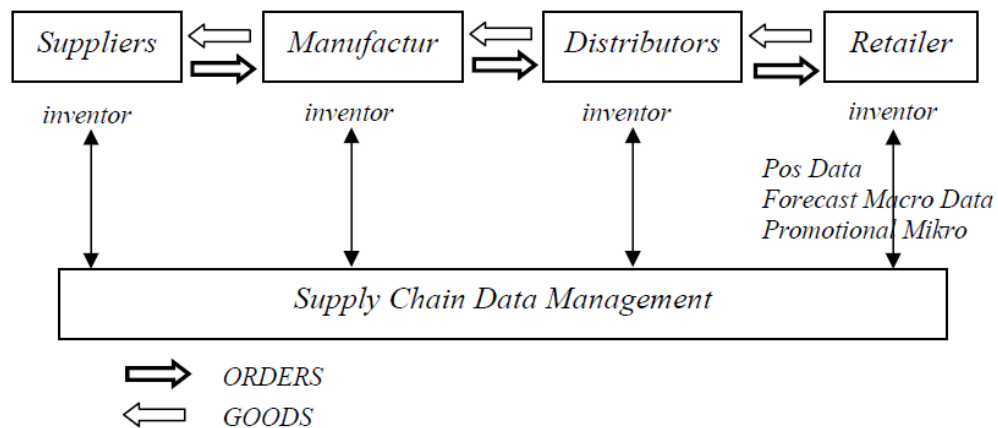
Supply Chain Management is a system that can coordinate the process of moving materials, information, and finance in a company. One factor that requires costs in marketing products is logistics management consisting of product design, material procurement, production, inventory control, and storage of goods. This coordination is within the company and for all activities outside the company. The goal is to make managing raw material inventory more effective and efficient. Supply chain management There is material flow and information flow. Purpose Supply Chain Management It must keep materials flowing from the source of production to the end consumer by utilizing the flow of information and the power of technology that allows demand and supply data quickly and can increase the level of detail of a product [2]. The purpose of the study is to forecast the stock of wedding souvenir products by empirically testing the facts/elements of the existence of Supply Chain Management. And to analyze existing industrial processes and whether they become more effective with Supply Chain Management. This research contributes to using supply chain management to help the process meet customers' needs and run efficiently.

LITERATURE REVIEW

A. Supply Chain Management (SCM)

Supply Chain Management is a supply chain that integrates material and service procurement activities, conversion into semi-finished goods in the final product, and delivery

to customers [3]. Information Exchange, long-term relationships, and Integration Processes are some influencing factors in the *kinerja supply chain management* company [4]. Principles used in *supply chain management* are: “Getting the right product, to the right place, at the right time, for the right price”[5].



Gambar 1. *The Interenterprise Supply Chain Model*

Central purpose *Supply Chain Management* between [6] other:

1. Timely delivery or delivery of products to satisfy consumers
2. Reduce costs.
3. Improve the results of the entire supply chain (not just one company).
4. Reduce time.
5. Centralize planning and distribution activities.

B. Main Components of Supply Chain Management

Flow on *supply chain management*, which should be managed according to Turban Rainer and Porter [8]: 1) *Upstream supply chain* covers the activities of a company *Manufacturing* with its dealers (*manufacturers, assemblers*) and connection (*second-tier*). The main activity in the *upstream supply chain* is procurement [7], such as 2) *Internal supply chain*, including all processes of entering goods into warehouses that transform inputs from suppliers into organizational outputs. The main concerns in the internal supply chain are production management, Manufacturing, and inventory control. 3) *The downstream supply chain* includes all activities involving the delivery of products to end customers [7].

C. Information Sharing

Information is used to make decisions that must be obtained quickly, quickly, and of good quality. Sharing knowledge is done accurately and transparently. Information sharing is the continuous flow of formal and informal communication between partners and contributes to better planning and supervision in a series [8].

D. Long Term Relationship

A long-term relationship (*long-term relationship*) is a perception of the buyer's interdependence on suppliers, either in the context of the product or the relationship expected to benefit the buyer in the long run [9]. The relationship between *the supplier, customer*, and the company must be well managed and continually improved to establish a sustainable relationship. The *supplier* Participates in the quality of the product so that the distribution of products from upstream to downstream is on time to the end user. So the improvement of good relations in the long term and mutual trust between companies, *suppliers* and *customers* *sangat* Necessary to achieve efficiency in company performance [9].

E. Forecasting

Forecasting is estimating how much demand is in the future, which includes needs in terms of quantity, quality, time, and location needed to meet the demand for goods or services [10]. Demand forecasting is the level of demand for products that are expected to be realized for a certain period in the future, according to Render and Heizer et al. [11]. Good forecasting is forecasting that is done by following reasonable preparation steps or procedures that will determine the quality or quality of the forecasting results prepared. There are three crucial forecasting steps, namely [12]: 1) Analyzing past data, this stage is helpful for patterns that occurred in the past; 2) Determine the data used; 3) Projecting past data using the methods used and considering several change factors (changes in policies that may occur, including changes in government policies, development of community potential, technological developments and discoveries).

F. Moving Average Method

The Moving Average m method is used to find the average value of a set of data owned using n Data as an average factor. The higher the value n What a data set uses will result in a smoother graph[13]. The calculation of values is based on a specific distance function. If the value averaged has proximity to the output value, then the output value is obtained by the value itself. The algorithm forming this method is developed through two steps, namely:

1. The distance to the surrounding point is calculated for the output value to determine the weight value. There are two principal metrics in this case:

Reverse distance:

$$\text{Weigl} \frac{1}{d^n} - 1$$

Linear descent:

$$\text{Weigh} 1 - d^n$$

2. Where d is the distance relative of one point to the output point. Weighting It is simply formed through the equation:

$$\text{Output value} = \frac{\sum(W_i.val)_i}{\sum W_i}$$

with:

Wi = Weight value for point i

Vali =Value of point i

G. Measurement of Forecasting Accuracy

Forecasting accuracy will be measured using the Mean Square Error (MSE) function, Mean Absolute Percentage Error (MAPE), and standard deviation.

1. Mean Squared Error (MSE)

Mean Squared Error (MSE) is used by squaring all errors produced divided by the number of forecasting calculation periods [14].

$$MSE = \frac{\sum |At - Ft|^2}{n}$$

Where:

At : Actual Demand in period t

Ft : Demand Forecasting in period t

n : The number of forecasting periods involved.

2. Mean Absolute Percentage Error (MAPE)

MAPE indicates forecasting accuracy in percentage form. Accuracy calculations with MAPE are usually more widely used because they are easy to read (because they are in percentage form) [15].

$$MAPE = \frac{\sum_{t=1}^n \left| \frac{x_t - f_t}{x_t} \right|}{n} \times 100\%$$

where:

n = time period value

x_t = actual value in the t-th period

f_t = forecasting value in the T-th period

3. Mean Absolute Deviation (MAD)

Mean Absolute Deviation is a method used to assess forecasting calculation results (evaluation). Mean Absolute Deviation (MAD) is the average of absolute errors in a calculation regardless of the size of the forecasting results that have been obtained.

Formula:

$$MAD = \frac{\sum |A_t - F_t|}{n}$$

Where:

A_t : Actual Demand in period t

F_t : Demand Forecasting in period t

n : Number of forecasting periods involved

METHODOLOGY

This research, in the form of quantitative analysis, is a research method based on the philosophy of positivism and is used to examine a specific population or sample.

Population and Sample

The population used is the number of requests for wedding souvenirs each month. The sample of this study is the number of requests for wedding souvenirs for ten months, namely from January – October 2022, which will be used as input data for forecasting demand from September to December 2022. The object of this research was carried out at the Anggrek Souvenir shop, whose scope was limited to wedding souvenirs. The source of this research data is quantitative data. Quantitative data in the form of demand data for wedding souvenir

products includes data on the amount of raw materials from suppliers, data on the production process of wedding souvenirs, data on the storage process of wedding souvenirs that are ready to be sold to consumers, and data on souvenir distribution activities, as well as consumer satisfaction data. Data Analysis Techniques.

1. Data Pattern Analysis

The first step in forecasting demand with a time series model is to consider the product demand data pattern type. The instrument used to test data patterns is autocorrelation (rk), the correlation between variable and time difference values. Autocorrelation tests can be used to identify types of data patterns. The autocorrelation test is divided into ACF (autocorrelation function) and PACF (partial autocorrelation). Non-seasonal data is said to be stationary if the correlation coefficient is zero for all different levels.

2. Demand Forecasting Data Analysis

Analyze demand forecasting data using time series forecasting models. as follows..

a. Moving Average Method

The moving average method is a technique that averages the most recent actual values and updates them when new values become available. The moving average method is a technique that averages the most recent actual values and updates them when new discounts become available.

b. Exponential smoothing

The exponential smoothing method is a weighted moving average forecasting technique where an exponential function weights data.

c. Trend projection

The trend projection method uses linear regression analysis by matching trendlines to historical data points and then projecting those lines into forecasts.

To measure the accuracy of forecasting results, a calculation of historical error of forecasts is carried out using the following analysis: 1) MAD is a method of evaluating forecasting techniques, a measure of the difference or difference between forecasts and actual demand. The smaller the MAD, the more accurate the value of a forecast, 2) MSE is an alternative method for evaluating forecasting techniques; each error (difference between actual data and forecasting data) is squared, then summed and divided by the amount of data, 3) MAPE (mean absolute percent error) MAPE is a percentage calculated from the total error value in each period and divided by the actual amount of

data to find the average error. MAPE scores perform very well if they are below 10% and perform well if MAPE scores are between 10% and 20%.

RESULTS

Demand Forecasting Analysis

Data on demand for wedding souvenir products in 2022 are as follows:

Table 1. Wedding Souvenir Product Demand Data in 2020

Moon	Demand
January	3750
February	3350
Maret	3100
April	2850
From	3250
June	3500
July	3720
Agustus	3280
September	3010
October	2900

Demand forecasting activities are used to forecast demand in November–December 2022. The analysis results according to the demand forecasting method used are as follows.

1) **Moving Average Method**

The moving averages method uses four months. Demand forecasting activities are carried out by adding up the demand for wedding souvenirs for four months, namely January to April, then the results are divided by 4. The results of forecasting demand for wedding souvenir products using the moving average method of 3227.5 with MAD 312.5, MSE of 140308.3, and MAPE of 9.6.

2) **Pemusulan Exponensial (*exponential smoothing*)**

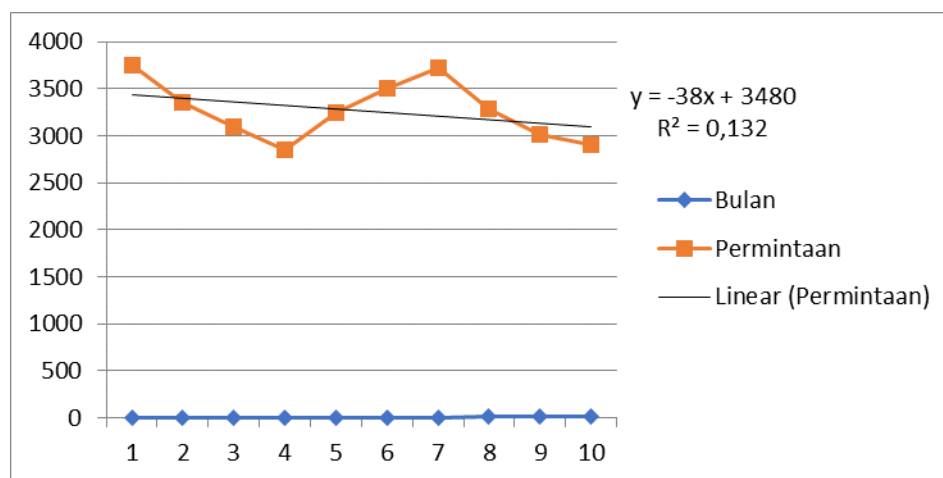
The exponential smoothing method has a range of alpha constant values of 0.1 to 0.9. After calculation, the results of forecasting demand for wedding souvenir products are presented in table 2. Based on the data below, the forecasting that produces the smallest MAD and MAPE uses alpha 0.9.

Table 2 Recapitulation of Demand Forecasting Results

Alpha	Forecast	Error		
		MAD	MSE	MAP
0,1	3416,078	412,475	219610,9	13,41382
0,2	3257,249	369,9033	170586,5	11,90221
0,3	3169,463	349,1708	150533,2	11,13057
0,4	3106,854	348,4862	139775,5	11,02341
0,5	3053,398	350,2171	131456,3	11,01614
0,6	3006,208	345,6646	123321,6	10,82566
0,7	2966,578	335,5667	115105,4	10,48008
0,8	2935,866	321,4368	106946,8	10,01232
0,9	2914,115	304,9803	99338,48	9,477642

3) Trend projection

The trend projection method uses trend analysis techniques whose results are as follows:



Gambar 1. trend projection

From Figure 1. It can be seen that the results of forecasting product demand with the trend analysis method obtained a forecast of 3062 with a coefficient of determination of 13.2. A comparison of forecasting results using three demand forecasting methods, namely the moving average method, exponential smoothing method, and trend projection method, shows that the exponential smoothing method is most effective for forecasting product demand in the next period because it has a relatively small MAD, MSE, MAPE method.

CONCLUSION

Based on the research and data analysis results, the conclusion was that trend analysis obtained a forecast of 3062 with a coefficient of determination of 13.2. From the comparison of 3 forecasting methods, the practical method is exponential smoothing.

REFERENCE

- [1] L. Saptaria, "Forecasting Demand for Black Jellyfish Products in Maximizing SCM (Supply Chain Management)," *J. Manaj. and Entrepreneurship*, Vol. 3, No. 1, pp. 57–66, 2016.
- [2] A. Khadijah, T. Akbari, and S. Maarif, "Analisis Supply Chain Ikan Tuna Di Ppi Binuangeun Supply Chain Analysis of Tuna in Binuangeun Fishing Port," *Bul. Ilm. "MARINA" Sos. Ekon. Sea. and Fishery.*, vol. 5, no. 1, pp. 21–28, 2019.
- [3] H. Apriani, C. I. Erliana, and M. Zakaria, "Analysis of Vaname Shrimp Supply Chain Management (SCM) in Teupin Trawl Village, East Aceh Regency," *Pros. Semin. In. Tek. Ind. 2019*, 2019.
- [4] M. Ansori, "Analysis of the implementation of supply chain management on the performance of furniture companies (study on the Indonesian Furniture and Handicraft Industry Association, Jepara Raya Regional Commission)," *Wahana*, vol. 20, no. 2, pp. 45–52, 2017.
- [5] I. Pratiwi *et al.*, "Product Distribution Analysis with Supply Chain Management Approach and Beer Game Application," pp. 29–39.
- [6] R. Triyanti and R. Yusuf, "Lobster Supply Chain Management Analysis (Case Study in Simeulue District, Aceh)," *J. Sauce. Ekon. Sea. and Perikan.*, vol. 10, no. 2, p. 203, 2016, doi: 10.15578/jsekp.v10i2.1260.
- [7] A. Roa *et al.*, "Influence analysis," pp. 143–164, 2010.
- [8] D. Ariani and B. M. Dwiyanto, "Analysis of the Effect of Supply Chain Management on Company Performance (Study on Small and Medium Industries of Processed Food Typical of Padang, West Sumatra)," *J. Stud. Manaj. Organ.*, Vol. 10, No. 2, pp. 132–141, 2013, doi: 10.14710/jsmo.v10i2.5910.
- [9] A. Y. Fitrianto, B. Sudaryanto, and J. Manajemen, "The Effect of Supply Chain Management on Outlet Operational Performance (Study on Mobile Counter registered at PT. Multikom Indonesia Semarang Branch)," *Diponegoro J. Manag.*, vol. 5, no. 2, pp. 1–11, 2016.

- [10] F. Pakaja and A. Naba, "Car Sales Forecasting Using Neural Networks and Certainty Factor," *Neural Networks*, vol. 6, no. 1, pp. 23–28, 2015.
- [11] E. Y. Nugraha and I. W. Suletra, "Analysis of the Best Demand Forecasting Method for Oxygan Products at PT. Samator Gresik," *Semin. and Conf. Us. IDEC*, pp. 2579–6429, 2017.
- [12] S. Wardah and I. Iskandar, "Analysis of Sales Forecasting of Packaged Banana Chips Products (Case Study: Home Industry Arwana Food Tembilahan)," *J@ti Undip J. Tek. Ind.*, vol. 11, no. 3, p. 135, 2017, doi: 10.14710/jati.11.3.135-142.
- [13] F. Fahrulian, H. M. Manik, and I. Jaya, "Application of Moving Average Method and Digital Terrain Model (DTM) for 3-dimensional bathymetric visualization of Multibeam Echosounder data," *J. Teknol. Perikan. and the Sea.*, vol. 7, no. 2, pp. 117–124, 2017, doi: 10.24319/jtpk.7.117-124.
- [14] F. Nugraha, B. Surarso, and B. Noranita, "Decision Support System for Evaluating the Selection of Asset Procurement Winners with Simple Additive Weighting (SAW) Method," *J. Sist. Inf. Business*, Vol. 2, No. 2, pp. 67–72, 2012, doi: 10.21456/vol2iss2pp067-072.
- [15] A. U. Ukhra, "Modeling and forecasting time series data with seasonal arima method," *J. Mat. UNAND*, Vol. 3, No. 3, p. 59, 2014, DOI: 10.25077/jmu.3.3.59-67.2014.