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MITIGATE LOST SALES USING FORECASTING DEMAND IN RAHINA INDONESIA

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Abstract. Forecasting demand is a crucial tool for every business to achieve efficiency in planning the operation management plans especially in fashion industry. The fashion trend which rapidly changing every period is one of the factors that influenced the demand of the product to be uncertain. In order to maximize the profit, every company should avoid the lost sales by having good forecasting demand system. Rahina Indonesia as a Small Medium Enterprise in Bandung has no proper forecasting method that suit with the actual demand. The company currently using qualitative forecasting method which using the CEO of Rahina Indonesia's judgement. High amount of lost sales became the biggest problem for the company and it occurred the most especially to voal hijab type which considered as the biggest contributor for company's sales. The company losing the potential profit for every number of items that lost sales. Analysis using 6 months past demand was used to determine the forecasting method. It turns out the most suitable forecasting demand for Black, Navy, and Maroon voal hijab is time decomposition multiplicative method which the method has the lowest MAPE, MAD, and MSD. The new forecasting method reduce the amount of lost sales. On black hijab voal, it reduces the lost sales from 389 to 78, on navy it reduces from 229 to 41, and on maroon it reduces from 225 to 13. By applying this forecasting demand method, the company will reduce their lost sales which can maximize their profit and obtain more revenue. The accurate forecasting also gives the company more preparation for the inventory to face the uncertain demand in the future.

Keywords: Forecasting Demand; Fashion; Planning; Time Series Decomposition; Lost Sales.

INTRODUCTION

Fashion is one important industry for Indonesia which has a significant growth and huge contribution as a subsector in creative economy industry sector. According to BEKRAF statistical data and survey result in 2015, the amount of creative economics' PDB is 852 trillion rupiahs and grow about 4.38 percent. Fashion has an important role for Indonesia's economic growth and provide big opportunity in creative industry while also a competitive industry which a lot of emerged competitor raising.

In facing the challenges and competition, every company should have an accurate planning in order to fulfil the demand. Fashion industry become more complicated since fashion trend is rapidly changing every period which is one of the factors that influenced the demand of the product. The demand is unstable and it affect the company's decision strategy that has purpose to achieve their target profit. In order to maximize the profit, every company should avoid the lost sales. Lost sales are those selling opportunities that a firm lost because an item was out of stock, or a firm does not carry a particular brand, line of merchandise, and any other possibility that causes the seller to lose the opportunity to sell (Jarret, 2015).

The high demand sometimes makes the company cannot fulfil the demand which leads to the occurrence of lost sales. To avoid the lost sales, an accurate forecasting demand is needed and crucial to predict the upcoming demand. Forecasting is used to predict what will happen, and the use of forecasts in planning would help the company make a good decision about the most attractive alternatives for the company (Makridakis & Wheelright, 1989). It is a crucial thing for company to achieve an effective and efficient operation management planning, especially in fashion industry.

In this paper, the object of the research is Rahina Indonesia. Rahina Indonesia is a Small Medium Enterprise company in fashion industry which manufacturing and retailing fashion products especially hijab products in Bandung. Rahina Indonesia has several varieties of product that the sales are dominated with basic voal hijab. Basic voal is one variety which is the best seller among other varieties. It contributes more than 85% of the overall company sales every month during October 2018 until March 2019. Black, Navy, and Maroon color are the highest contributor among another color in Basic Voal type. These huge amounts of sales also become problem that these three colours had lost sales.

The company has lost their potential profit in Basic Voal Hijab type especially in Black Basic Voal, Navy Basic Voal, and Maroon Basic Voal. Rahina Indonesia still does not have an appropriate forecasting method because the existence method they use is using judgement or qualitative forecasting to predict the upcoming demand. Qualitative forecasting is methodology that uses

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expert judgment which depends on the knowledge and experience of the forecaster (Accounting Tools, 2018). In Rahina Indonesia, the CEO take the role to do the qualitative forecasting. Unfortunately, the result of using this method are often not match with the demand in Rahina Indonesia cases and it make a lot of demand could not be fulfilled.

LITERATURE REVIEW

Lost sales is a measure of the firm's condition where they lost the opportunity to fulfil the upcoming demand because of various reason. The company cannot maximize their potential profit when they had number of lost sales. On this research, time series forecasting demand method will be used based on the historical demand and sales data. Time series methods are used for a forecasting in short period and the method used historical data about demand. There are four characteristics of forecasting the demand. The forecast is always inaccurate but has expected accuracy and level of forecast error, short-term forecast produces more accurate result rather than long-term forecast, aggregate forecast would be more precise than disaggregate forecast, and the result's accuracy is depending on how farther up the demand forecast from the consumer (Chopra & Meindl, 2014).

When choosing a forecasting method, we will first need to identify the time series patterns in the data, and then choose a method that is able to capture the patterns properly. The forecast depends of various factors consists of seasonality, trends, cyclicity, projects, events and random effects (Heizer & Render, 2011). The time series data of Black, Navy, and Maroon hijab voal has trend and seasonality which indicate the method that can be used are Additive time series decomposition with trend and seasonal, Multiplicative time series decomposition with trend and seasonal, Holt-Winter Method, and Seasonal Autoregressive Integrated Moving Average (SARIMA).

METHODOLOGY

The first step is data collection from the company. The company provide 24 weeks data for historical demand and sales data. In choosing which method that suit with the company's condition, there are several steps in determining the forecast method when using time series data. According to Gharde (2016), it needs to examines the pattern inside the data and the pattern will result the potential methods which can be used.

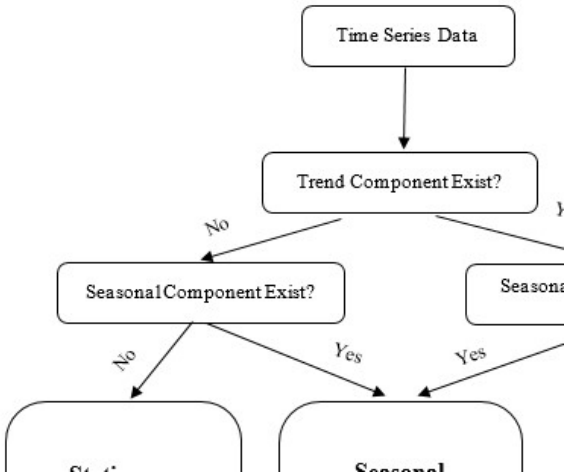

Figure 1. Potential Forecasting Method (Gharde, 2016)

According to Figure 1, since the historical demand data show trend and 4 weeks length seasonality for the three hijab colors, the method that potentially used are Time Series Decomposition, Holt-Winter Method, and Seasonal Autoregressive Integrated Moving Average (SARIMA). All method calculation was using Minitab 18. For Holt-Winter Method, it requires to determine optimal value of $\alpha, \beta,$ and γ. Researcher using Solver tools in Microsoft Excel in order to get the optimal value of $\alpha, \beta,$ and γ, and lowest error. In calculating SARIMA, the steps are data collection and preliminary analysis, identification of the model, estimation of parameters and choice the model, diagnostic check, and the last is forecast. After that, do the analysis and measure the error of each forecasting method result using MAD, MSE, and MAPE. Then, the chosen forecasting method for each hijab type would be simulated by applying the forecasting result or predicted demand to the existing inventory. It will show if the forecasting method mitigate the lost sales and generate better output.

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FINDINGS AND ARGUMENT

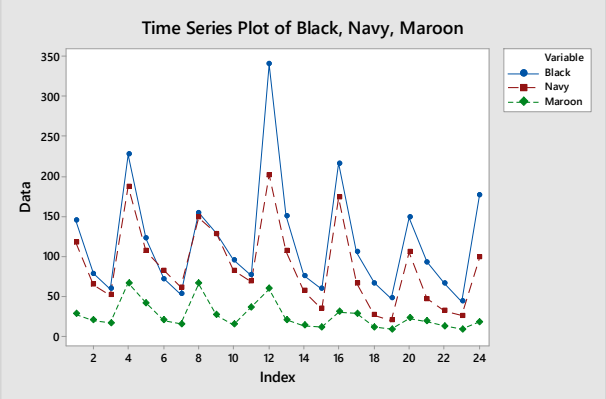

Figure 2. Time Series Plot

According to Figure 2, there are patterns which the demand was increasing simultaneously reach the peak in week 4 and in week 1, 2, and 3 the demand is decreasing in each month which called seasonal pattern. The seasonal pattern occurs when the time series is affected by the seasonal factors such as time (Hyndman, 2011). These three data have similarities on seasonal length which is 4 seasonal lengths. But, the result of every method would be different and has their own pattern of forecasted data. On time series decomposition, the trend and seasonal component are used in the calculation. All of the color are more fit when using the multiplicative model rather than additive model. In Winters' Method, trend, level, and seasonal component is used to generate the best model. It also has two model of calculation which are additive model and multiplicative model and the result is more fit to the multiplicative model. In calculating SARIMA, first the data should be stationary in variance and mean. To test the variance and transforming it to be stationary, Box-Cox Transformation usually used (Rosadi, 2012). If the data not stationary in mean, differencing is needed. By looking to ACF and PACF plot, it turns out the model which is significant and pass the diagnostic test for black color is *ARIMA* $(0,1,1)(0,1,1)^4$, for navy color is *ARIMA* $(0,1,1)(0,1,1)^4$, and for maroon color is *ARIMA* $(2,1,0)(1,0,0)^4$.

Table 1. Forecasting Method Comparison

Color	Method		MAPE	MAD	MSD
Black	Time Series Decomposition	Additive	15.26	19.44	1107.44
		Multiplicative	13.31	18.11	1064.79
	Winter's Model	Additive	35.20	38.46	2383.93
		Multiplicative	17.535	20.642	696.380
	SARIMA		-	-	1408.97
Navy	Time Series Decomposition	Additive	22.874	16.392	403.663
		Multiplicative	20.846	15.889	372.785
	Winter's Model	Additive	45.66	29.11	1271.96
		Multiplicative	40.82	32.31	1920.88
	SARIMA		-	-	517.057
Maroon	Time Series Decomposition	Additive	36.525	7.7478	91.1439
		Multiplicative	21.8208	5.5826	63.4613
	Winter's Model	Additive	64.432	13.182	209.023
		Multiplicative	41.479	9.353	1472.20
	SARIMA		-	-	137.274

Based on the comparison, the lowest error among all the method is Time Series Decomposition for Black, Navy, and Maroon color hijab voal. Inside this method, there are two model which are additive and multiplicative model. Based on Table 1, the multiplicative model has the lowest error compared with the additive one. The multiplicative model calculation is multiplying the seasonality and trend component. Multiplicative model is more preffered compared with the additive model because the calculation of multiplicative model is more match with the demand data of the three products that shrinks and enlarges. Thus, Time Series Decomposition with multiplicative model is chosen as the best method for Rahina Indonesia because it has the lowest error and the forecast result is fit with the actual demand. To look the effectivity of the forecast method, researcher do simulation that comparing the existing forecasting method with the new proposed forecasting method. The simulation here is

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simulating when the demand occurs and number of forecasting is the number of supply the company had. On existing forecasting method, number of supply are determined based on the existing method. On proposed forecasting method, number of supply are determined based on the result of forecasting or predicted demand. The simulation using the proposed method is describe the condition if the company do the forecasting using this time series decomposition method and create the order number as amount of the predicted demand. After doing the simulation, the result is as follows:

Table 2. Simulation Result

Black		Navy		Maroon	
Existing Method Lost Sales	Proposed Method Lost Sales	Existing Method Lost Sales	Proposed Method Lost Sales	Existing Method Lost Sales	Proposed Method Lost Sales
389	78	229	41	225	13

From the simulation result table, it is show that the proposed method which is time series decomposition with multiplicative model has mitigating huge amount of lost sales. İt can be seen that the lost sales decrease significantly from 389 to 78 for black color, from 229 to 41 for navy color, and 225 to 13 for maroon color. This decrease of lost sales make the company can mitigate their probability to losing their potential profit or revenue and generate more profit.

CONCLUSIONS

In this paper, the best forecasting method for three color hijab voal is time series decomposition with multiplicative model which produce lowest error. The result of simulation also made a significant improvement which the model of forecast suits the condition of the company. On black hijab voal, it reduces the lost sales from 389 to 78, on navy it reduces from 229 to 41, and on maroon it reduces from 225 to 13. It is proven on simulation before that the forecasting method can suit the demand that uncertain over period. By lowering the number of lost sales, the company will maximize their potential profit. From the CEO of Rahina Indonesia, the potential profit for these three products per unit is around Rp17.000 and according to decrease number of lost sales, the company will have additional potential profit around Rp12,087,000 if using the proposed method. The proposed method is the recommendation for the company on doing the forecast especially in planning phase. This method will provide several good managerial impacts for the company. The company can use time series decomposition method with multiplicative model for predicting the upcoming demand since the forecasting method is more accurate than the existing forecasting method. By having an accurate forecasting demand method, the company can do estimation for the upcoming demand with the lowest error and fit with the company's demand pattern. It will help in stock planning in order to determine amount of stock that the company should provide. When the company can know the estimation for their demand in certain period, the preparation of the product also will be more prepared and the probability of lost sales will be decreasing.

REFERENCES

Accounting Tools. (2018, January 21). *Qualitative forecasting*. Retrieved from Accounting Tools Web site: https://www.accountingtools.com/articles/what-is-qualitative-forecasting.html

Badan Ekonomi Kreatif dan Badan Pusat Statistik. (2017). *Data Statistik dan Hasil Survei Ekonomi Kreatif.* Jakarta: BEKRAF dan BPS.

Chopra, S., & Meindl, P. (2014). Supply Chain Management: Strategy, Planning, and Operation. In *Supply Chain Management: Strategy, Planning, and Operation.*

CNN Indonesia. (2015, November 2). *Generasi Millenial RI Paling Impulsif Belanja Barang Mewah*. Retrieved from CNN Indonesia Website: https://www.cnnindonesia.com/ekonomi/20151102182452-92-88999/generasi-millenial-ri-paling-impulsif-belanja-barang-mewah

Heizer, J., & Render, B. (2011). *Operation Management.* Pearson.

Hyndman, R. J. (2011, December 14). *Cyclic and seasonal time series*. Retrieved from Rob J Hyndman Website: https://robjhyndman.com/hyndsight/cyclicts/

Jarret, J. E. (2015). An Analysis of Lost Sales. *Management and Economics Research Journal*, 2.

Khashei, M., & Bijari, M. (2011). A novel hybridization of artificial neural networks and ARIMA models for time series. *Applied Soft Computing*, 11.

Liu, N., Ren, S., Choi, T.-M., Hui, C.-L., & Ng, S.-F. (2013). Sales Forecasting for Fashion Retailing Service Industry : A Review. *Mathematical Problem in Engineering*, 1.

Makridakis, S., & Wheelright, S. C. (1989). *Forecasting Methods for Management (5th edition).* Chichester: Wiley.

Rosadi, D. (2012). *Ekonometrika & Analisis Runtun Waktu Terapan dengan Eviews.* Yogyakarta: Andira Publisher.