PRODUCTIVITY IMPROVEMENT WITH SHORT-TERM QUANTITATIVE FORECASTING METHOD CASE STUDY ON ABC STORE - TOKOPEDIA AND BUKALAPAK

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Abstract

ABC's baby and child toy store is a new player joining the online store website of tokopedia and bukalapak in January 2016; engaged in the business of selling toys and baby supplies. Products of ABC toy store is a product for buyer's consumer with medium and upper financial ability. ABC toy store sells imported toys and baby products with high quality products, using international grade production materials and ISO production certificates: 9002.

Meet the expectations of market demand is not easy; because by fulfilling all expectations, then the impact is the high stock of goods that must be available. Companies need to find an appropriate method to keep the stock of goods in the store is not too excessive and also stocks of goods are maintained at a safe level. This is the emphasis that the company should examine, how the procurement planning method is good and correct for the company to be more efficient.

The identification of the scope of forecasting using the method of short-term quantitative forecasting method should be based on actual stock out and stock in the warehouse. Actual conditions stock out is a point that always wanted by the company, the stock that is minimum - run out of course not desirable, because it indicates the loss of potential company profit.

Based on the previous description, the formulation of the problem in this study is: "What planning and forecasting management strategies can be applied to improve the productivity of ABC's online business unit?"

Keywords
Purchasing, Planning, Short Term Forecasting.

1 Introduction

ABC's baby and child toy store is a new player joining to online store website of tokopedia and bukalapak in January 2016; engaged in the business of selling toys and baby supplies. Product ABC toy store is a segmented market dedicated to consumer with medium and upper financial ability. ABC toy store sells imported toys and baby products with high quality products, using international grade production materials and ISO production certificates: 9002.

With this conceptual establishment ABC's business line is as a provider (seller) toys and premium baby gear brand; then the scope of the product sold must meet all expectations of market demand. Meet the expectations of market demand is not easy; because by fulfilling all expectations, then the impact is the high stock of goods that must be available. Companies need to find an appropriate method to store existing stocks on the store is not too excessive and also the stock of goods is maintained at a safe level. This is the emphasis that the company should examine, how the procurement planning method is good and correct for the company to be more efficient.

From table 1 we can see that the demand for goods from January to August . In August Little tikes brand position on ranks 1 or 2 from total sales. This data is required for forecasting calculations.

Table 1 Goods sold Jan – Aug 2017

	Jan	Feb	Mar	Apr	Mei	Jun	Jul	Agu
Merk	Sum of Qy	Sum of Qy	Sum of Qy	Sum of Qy	Sum of Qy	Sum of Qy	Sum of Qy	Sum of Qy
Babyelle	7	2	0	5	1	15	18	7
Ching Ching	13	18	11	22	27	28	60	26
Crayola	1	0	0	2	2	2	2	1
Grow n Up	30	44	35	38	49	34	53	40
Haenim	12	3	6	0	0	0	34	8
JOIE	3	5	2	3	6	23	33	11
Labeielle	42	62	66	71	73	50	99	67
Learning R	5	2	1	3	0	3	0	2
Lerado	27	1	0	9	2	0	9	7
Little Tikes	10	27	32	58	65	76	93	52
Pliko	13	9	14	7	6	9	3	9
Tommee Tippee	13	10	2	4	10	20	8	10
Vtech	0	6	17	15	24	9	28	14
Barbie	0	0	0	1	1	1	0	1
Melissa & Doug	0	0	0	3	1	4	11	3
The First Years	0	0	0	0	0	3	0	1
Total	176	189	186	241	267	277	451	259

The identification of the scope of forecasting using the method of short-term quantitative forecasting method should be based on actual stock exit and stock in the warehouse. Actual stock conditions is an important point that is always wanted by the company, but the stock is thinning - run out of course not desirable. Because it indicates the loss of potential companies for gain profit. Sample - the depletion of the stock is shown with Figure 1

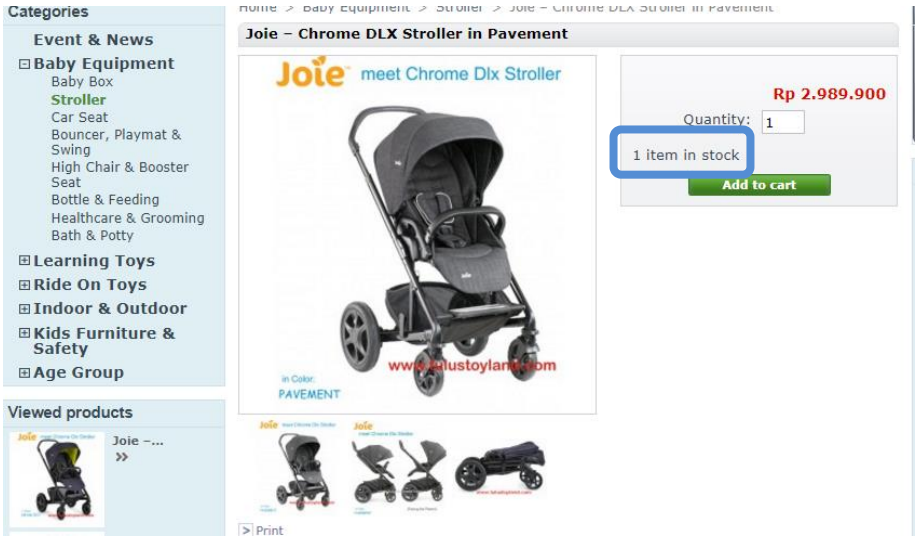


Figure 1 is depleted and will be depleted stock of goods

Beside the thinned constraints or the depletion of stock merchandise store, then another constraint is the existence of a relatively large stock in quantity. It causes the load on the warehousing sector. Figure 2 shows the high stock of goods in the warehouse.

Figure 2 condition of stock of goods that relative lots

ABC stores in this case make sales on 2 pieces of the largest online store sales site in Indonesia namely Tokopedia and Bukalapak.

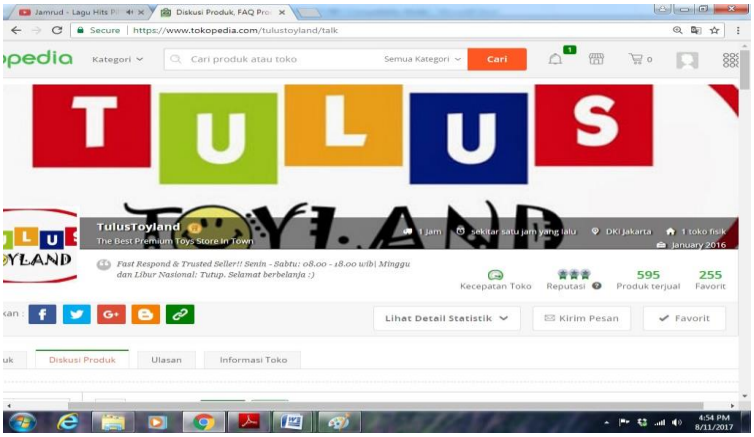


Figure 3 ABC shop display on tokopedia site

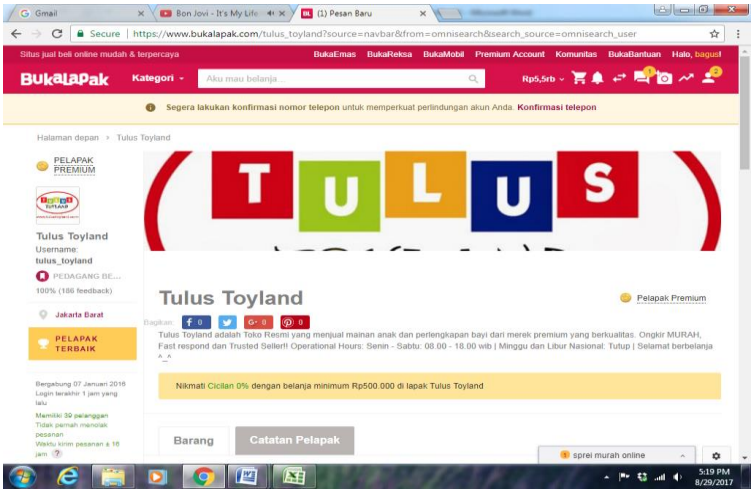


Figure 4 ABC shop display on Bukalapak site

2 Theoretical Background

Forecasting is the art and science of predicting future events. Forecasting requires the retrieval of historical data and projecting it into the future with some form of mathematical modeling. It could be a subjective or intuitive prediction of the future. Or forecasting may include a combination of mathematical models tailored to a good judgment by managers.

There are two general approaches used in forecasting: quantitative forecasting and qualitative forecasting. Quantitative forecasting uses a variety of mathematical models that use historical data and / or variable causal variables to forecast demand. Subjective or qualitative forecasting utilizes important factor factors such as intuition, personal experience and value-making systems. Some companies use one approach, others use another approach: but in combination or mixed practices both types of forecasting are usually more effective.

Causal model. Linear regression, a causal model, merges into a variable or relationship model that can affect a predictable amount. The causal model of lawnmower sales could include relationships such as new housing construction, advertising budgets and the price of pairs. Based on the previous description, the formulation of the problem in this study is: "What planning and forecasting management strategies can be applied to improve the productivity of ABC's online business unit?"

3 Research Method

Research will be conducted research depicted in the flow chart depicted in Figure 5 as follows:

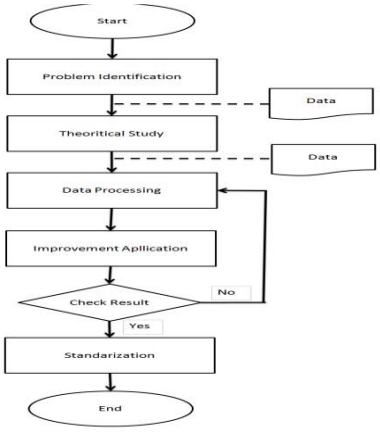


Figure 5 Research Method

4 Result And Discussion

From table 2 can be analyzed that the value of inventory always experience an increasing trend from month to month. The significant increase is in June - July where quantity increase is in 90 units of goods. This quantity increase must of course be a moving asset (liquid asset) which is an embedded capital that can be done immediately in time sales. Increased inventory with low / long selling capabilities is highly undesirable.

Table 2 Stock of goods for each Brand Period Jan - Aug 2017

	Jan (un)	Feb (Un)	Mar (Un)	Apr (Un)	Mei (Un)	Jun (Un)	Jul (Un)	Agu (Un)
Baby Elle	24	35	33	33	28	47	36	18
Barbie	4	4	4	4	3	2	1	1
Ching Ching	26	31	37	32	34	39	45	43
Crayola	1	0	6	6	4	8	6	4
Grow n Up	1	34	47	42	88	63	38	7
Haenim	15	3	6	0	0	0	0	20
JOIE	15	24	19	20	17	38	51	44
Labeille	69	92	137	115	112	67	117	105
Learning R	10	5	15	14	11	11	8	8
Lerado	0	4	3	6	3	1	2	1
Little Tikes	121	159	132	163	186	196	160	130
Melissa & Doug	0	0	0	12	9	8	76	65
Pliko	48	66	57	43	36	54	62	58
The First Year	6	6	6	6	6	6	3	3
Tommee Tippee	92	115	105	103	102	128	162	154
Vtech	98	97	91	95	89	131	122	94
Grand Total	530	675	698	694	728	799	889	755

4.1 Exponential Smoothing Calculations

Exponential smoothing (exponential smoothing) is a convenient and efficient forecasting method when done with a computer. Although it is a moving average technique, the exponential smoothing includes very little past data maintenance. The basic exponential smoothing formula is as follows:

$$F_t = F_{t-1} + \alpha\,(A_{t-1} - F_{t-1})$$

Note,

F_t = New Forecasting
F_{t-1} = Previous Forecasting
α = Exponential smoothing
A_{t-1} = Previous actual demand

The concept is not complicated. The estimate of the last request is the same as the previous estimate, adjusted slightly from the difference between the actual demand of the past period and the previous estimate. The refining constants α, generally between 0.05 to 0.5 for business applications. The smoothing constants can be altered to give larger scales on new data (when α is high) or on past data (when α is low). To be sure, past periods decreased rapidly as α increased. If α reaches extreme value of 1.0 then in equation $F_t = 1.0\,A_{t-1}$. All the older values are omitted, and the forecast becomes identical to the naive model are meant the forecast for the next period is the same as for this period. Table 3 shows the results of calculations for the Labeille brand during the period January to August 2017. The forecasting results are performed with an exponential smoothing with the test result value α = 0.10 and α = 0.50.

Table 3 Forecasting the Labeille brand with rounding at the nearest actual value

Month	Actual Demand	Forecasting with α = 0.10	Forecasting with α = 0.50
1	**42**	50	50
2	**62**	49	46
3	**66**	50	54
4	**71**	52	60
5	**73**	54	66
6	**50**	56	69
7	**99**	55	60
8	**67**	60	79
9	**?**	60	73

To evaluate the accuracy of each smoothing constant, we can calculate absolute deviation (Mean Absolute Observations) or MAD abbreviations. A measure for overall forecasting errors for a model is the mean absolute deviation (MAD). MAD is calculated by taking the absolute number of forecasting errors and dividing by the number of data periods (n):

$$MAD = \frac{\sum[\ \text{Absolute Deviation}\ ]}{n}$$

In addition to the calculation of the average absolute deviation of the count; the mean squared error (mean Squared Error, MSE) is another way of measuring prediction errors overall. MSE is the mean of the squared difference between the predicted value and the observed value. The formula is:

$$MSE = \frac{\sum[\ \text{Absolute Deviation}\ ]^2}{n}$$

Table 4 shows the results of calculations for the Labeille brand during the period January to August 2017. The forecasting results are supplemented by MAD and MSE calculations.

Table 4 Forecasting Labeille brands with MAD and MSE calculations

Month	Actual Demand	Forecasting with α = 0.10	Actual Deviation with α = 0.10	Square Act Deviation α = 0.10	Forecasting with α = 0.50	Actual Deviation with α = 0.50	Square Act Deviation α = 0.50
1	42	50	8	64	50	8	64
2	62	49	13	164	46	16	256
3	66	50	16	241	54	12	144
4	71	52	19	360	60	11	121
5	73	54	19	364	66	8	56
6	50	56	6	34	69	19	371
7	99	55	44	1914	60	39	1550
8	67	60	7	54	79	12	152
9	?	60			73		
	Absolute Deviation		131	3194		125	2714
	MAD		16.41			**15.68**	
	MSE			399.31			**339.23**

Based on Table 4 we can analyze smoothing constants α = 0.50 more preferably than α = 0.10; because the MAD is smaller, so there are fewer forecasting errors. In terms of graphical analysis / trend figure 6, it will be able to meet the similarity of the forecasting trend of the calculations - the calculations that have been done is with the smoothing constants α = 0.50.

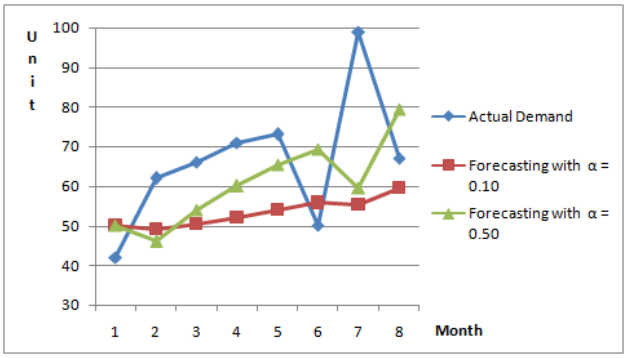


Figure 6 graph forecasting trend and actual demand

Similar calculations are performed with all brands in store stock. The exponential smoothing calculation method is studied by the nominal selection of α which results in the smallest deviation in each brand. Table 5 shows the results of recapitulation of forecasting calculations by the exponential smoothing method of all ABC store brands

Table 5 Recapitulation of forecasting calculations by exponential smoothing method

	Actual Demand	Exponential Calculation	Actual deviation
Babyelle	55	40	15
Ching Ching	205	160	45
Crayola	10	9	1
Grow n Up	323	297	26
Haenim	63	58	5
JOIE	86	44	42
Labeielle	530	484	46
Learning R	16	23	7
Lerado	55	82	27
Little Tikes	413	372	41
Pliko	70	80	10
Tommee Tippee	77	78	1
Vtech	113	83	30
Barbie	4	7	3
Melissa & Doug	22	9	13
The First Years	4	4	0
Total	2046	1828	218
	% Forecasting Accuration		**89.34%**

In the calculation of forecasting that has been done, it appears that the total forecasting is 1828 items of goods; whereas the actual total demand is 2046. With the total deviation between actual demand and forecasting is 218 items. Forecasting calculation results have an accuracy of 89%. The high level of accuracy of forecasting will have a positive impact on sales and cash flow of the company. Apart from accurate sales and forecast numbers; correct forecasting will give a positive contribution to the level of the stick in the warehouse. This is shown in Table 6 recapitulation of forecasting calculations with the ratio of warehouse stock.

table 6 recapitulation of forecasting calculations with warehouse stock comparison.

	Waho Stock	Exponential Calculation	Actual deviation
Babyelle	254	40	214
Ching Ching	287	160	127
Crayola	35	9	26
Grow n Up	320	297	23
Haenim	44	58	14
JOIE	228	44	184
Labeielle	814	484	330
Learning R	82	23	59
Lerado	20	82	62
Little Tikes	1247	372	875
Pliko	170	80	90
Tommee Tippee	961	78	883
Vtech	817	83	734
Barbie	23	7	16
Melissa & Doug	170	9	161
The First Years	42	4	38
Total	5514	1828	3686
	% Forecasting Accuration		66.85%

In the calculation of forecasting that has been done, it appears that the total forecasting is 1828 items of goods; while the total actual stock of warehouses is 5514. With the total deviation between warehouse stock and forecasting is 3686 items of goods. Forecasting calculation results have an accuracy of 66%. The high level of accuracy of forecasting will have a positive impact on the efficient allocation of warehouse area. Implementation of the value of forecasting calculation results will provide space for the warehouse about 34% of the area is relatively empty. Potential profit can be obtained by using the empty area with the stock of the latest models.

4.2 Tree Analysis Method

Table 7 Table of alternative brands ABC labeille store

Alternative	Good Economic (A1)	Bad Economic (A2)	Total
Reducing Variance (B1)	21,320,244	17,907,824	39,228,068
Increasing stocks (B2)	28,824,824	11,527,240	40,352,064
Total	50,145,068	29,435,064	79,580,132

The first thing to do is to forecast sales for the next period using exponential smoothing forecasting method, then testing error rate using MAD and MSE method. Next, the decision tree method is used to select the best alternative for the company that is the highest profit possible to achieve. The equation used to calculate the highest profit is shown in Table 7.

To determine the probability of each alternative, the Bayes theorem is used as follows:

$P (A_1) = 50.145.068 / 79.580.132 = 0.63$

$P (A_2) = 29.435.064 / 79.580.132 = 0.37$

$P (B_1 / A_1) = 21.320.244 / 50.145.068 = 0.42$

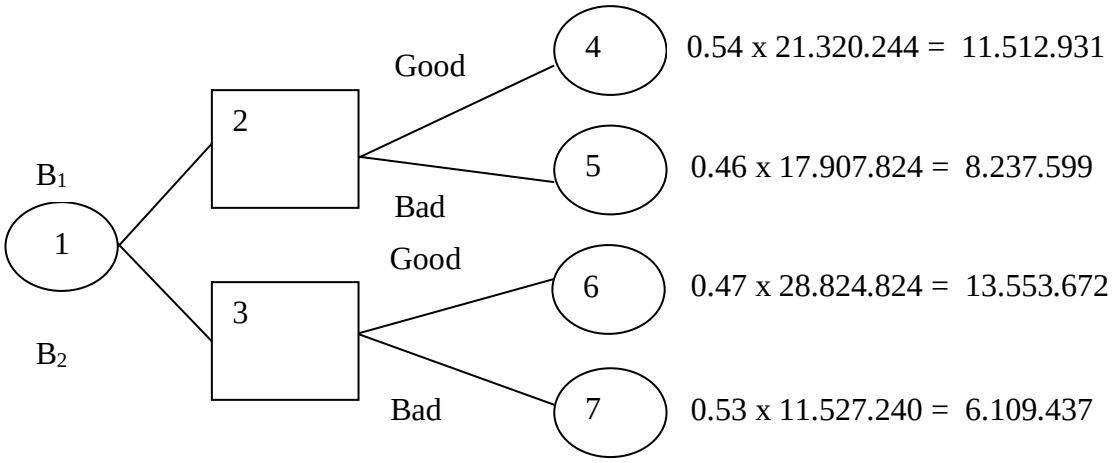
$P (B_1 / A_2) = 17.907.824 / 29.435.064 = 0.61$

$$P (A_1 / B_1) = \frac{0.63 \times 0.42}{(0.63 \times 0.42) + (0.37 \times 0.61)} = \frac{0.26}{0.48} = 0.54$$

$P(A_1 / B_2) = 1 - 0.54 = 0.46$

$$P(A_2 / B_1) = \frac{0.37 \times 0.61}{(0.63 \times 0.42) + (0.37 \times 0.61)} = \frac{0.22}{0.48} = 0.47$$

$P(A_2 / B_2) = 1 - 0.47 = 0.53$



Note :
B_1 value = 11.512.931 + 8.237.599 = 19.750.530
B_2 value = 13.553.672 + 6.109.437 = 19.663.109
Based on the calculation, the expected value of B1 is greater than B2. This indicates that the profit that companies get is greater when choosing alternative B1. Therefore, based on the decision tree, the alternative should be chosen by the company is alternative B1 that is reducing the number of type (variant) stock warehouse.

5 Conclusion

From the calculation and data processing, it is found that by forecasting using exponential smoothing method produces the total number of forecasting units is 1828 units and has an accuracy of 89% Improved forecasting method will be positively influenced to the warehousing sector; it can be seen from the potential warehouse can save an area of 34% By analyzing two alternatives that can be considered by companies using decision tree, it can be concluded that companies should choose alternative B1, that is reducing the number of type (variant) stock warehouse.

Acknowledgements

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Biographies

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