Optimization of the Minmax Function as Inventory Management on Non-Prescription Products at Kimia Farma Pharmacy Balikpapan

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Abstract

The minmax method is the method applied by Kimia Farma Pharmacy Balikpapan. There are some constraints in this method, such as empty stock, impact on turnover, and visits. The purpose of this research is to see the effect of optimization of minmax method on inventory management that affects customer satisfaction, increase in turnover and number of visits. The research method used descriptive quantitative *One Group Design Pre* and *Post Test* method and *cross-sectional* analytical survey. Researchers observed the variables of customer satisfaction, non-prescription turnover and visits before and after the minmax method intervention, looking at the correlation between customer satisfaction and the increase in turnover and visits. A survey was conducted with 379 customers before and after the intervention to see customer satisfaction. Optimization of the minmax method after the intervention, namely orders via defect with a frequency of every day, cito orders, adding SKU (*Stock Keeping Unit*) items, HR control of goods. The results of the study before the intervention were Pareto A *availability of* 81.2%, SKU 2453, and inventory life of 66 days. The customer satisfaction index is 3.38, the average non-prescription and visit turnover is Rp. 811,753,502 and 7818, while after the intervention the increase in pareto A *availability is* 95.8%, SKU 3346, and inventory life is 42 days. The customer satisfaction index is 4.61, the average non-prescription turnover and visits are Rp. 1,140,740,604 and 9940. Optimization of minmax method is successfully applied by Kimia Farma Pharmacy Balikpapan and has an influence on customer satisfaction, turnover, and visits.

Keywords: *Minmax Method Pharmacy, Inventory Management, Customer Satisfaction, Community Pharmacy, Visits.*

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A. INTRODUCTION

The minmax method is a method that has been widely applied in all large companies with the aim of making savings because this method only costs a little, generally savings occur in the cost of storing raw materials or storing goods (Rizky et al., 2017). PT. Kimia Farma Pharmacy is a pharmaceutical company engaged in pharmaceutical retail, where one of the obstacles is the management of merchandise inventory, so the company applies the minmax method, this policy was decided to be implemented in all Kimia Farma outlets across Indonesia by January 2022.

Kimia Farma Pharmacy Balikpapan is one of the pharmacies that must apply the minmax method as a technique for managing merchandise inventory. The data shows that in the period of April to June 2022, transactions that were rejected or not served were quite a lot, with the reason of limited stock of drugs. The number of rejected or unserviceable transactions for 3 months reached 339 transactions.

The application of the minmax method that is evenly distributed has several shortcomings from internal factors, namely (1) the program only reads 3 months of

pareto, (2) the program cannot predict future needs (3) human resources.

External factors are (1) geographical factors, (2) policies from distributors. This research aims to see the effect of minmax method optimization on inventory management and how it impacts on the improvement of customer satisfaction which is ultimately related to the increase of turnover and the increase of number of visits at Kimia Farma Pharmacy Balikpapan.

Inventory management is a system built by the company that is responsible for managing the company's inventory (Waters, 2003). These functions are related to planning, organizing, controlling, supervising and evaluating activities and procedures to ensure the right amount of each item is stored at any one time.

Crisp (in Santoso & Sucipto, 2013) states that the greater the customer loyalty to the company, the more valuable is the customer for the company. Customers who are very loyal will happily and voluntarily reveal positive things about the company's products and services to others, so loyalty management is a top priority and gets more attention from the company as one of the company's strategies to win business competition. According to Santi & Supriyanto (2022), and Sembiring et al. (2014) product quality and customer satisfaction have a significant effect on customer repurchase interest.

To increase the company's revenue, with efficient SCM (Supply Chain Management), the company can bring products to market faster than expected and respond better to customer demand. With reduced operating costs, SCM helps companies identify efficiencies in their supply chain. Higher asset utilization, with well-organized SCM, companies can optimize the use of their assets. Increased profits, with increased revenue and decreased costs, companies can achieve better profit margins. The company is growing, by implementing efficient SCM, companies can expand their reach and face better business growth (Widaryanto, 2012). Prawira & Jember (2020) mentions one of the influences on increasing revenue is the completeness of goods and length of business.

The Minmax method is an inventory control method that aims to ensure that inventory remains within certain predetermined limits, The basic principle of this method is to keep inventory between the maximum level and the minimum level. According to Ismunandar et al. (2018), the maximum level is the upper limit of the stock to be maintained. When stock reaches this level, no additional orders are placed. While the minimum level is the lower limit of stock that must be ordered immediately to avoid shortages. According to Salam & Mujiburahman (2018), and Kinanthi et al. (2016) applying the minmax method, the company is able to save operational costs. Bakhtiar & Salsabila (2021) mentioned that the Minmax method is recommended to be applied by PT Mitsubishi Chemical Indonesia in order to minimize operational costs.

B. METHODS

The research method uses the descriptive quantitative *One Group Design Pre* and *Post Test method*, by processing data obtained from the research location, to

identify between the independent variable, namely the inventory control method and the dependent variable, namely the increase in turnover and transactions. A *cross-sectional* analytical survey was also used to analyse between the independent variable and the dependent variable, namely customer satisfaction.

Respondents used in this study were 379 respondents. The research instrument is a questionnaire to measure customer satisfaction surveys and documents used to see turnover and transactions. The validity and reliability test of the questionnaire with the calculation of Cronbach's Alpha was carried out on 20 respondents. The validity and reliability test results show that the questionnaire is valid. The validity test shows the correlation coefficient value> 0.3 and Cronbach's Reliability Test Alpha > 0.6. The data normality test shows that the research data is normally distributed. The results of the research survey, turnover and transaction analysis will be analysed using a paired T-test and explained descriptively.

C. RESULTS AND DISCUSSION

1. Implementation of Minmax Method at Kimia Farma Pharmacy Balikpapan

The minmax method of Balikpapan Kimia Farma Pharmacy uses a web-based computerized system with indicators that are generalized throughout Indonesia. The indicators are the frequency of running the program in a month, safety stock, delivery time, minimum stock and maximum stock.

Each business unit is given a policy to optimize the minmax method so that there are no problems such as the length of distribution of goods and the vacancy of goods which results in rejection and lost turnover. The implementation of the minmax method before and after optimization can be seen in table 1.

Table 1. Implementation of minmax method before and after optimization

Description	Minmax Before Optimization	Minmax After Optimization
Frequency	2 times a month	2 times a month
Delivery time of goods	Standard 14 days	Standard 14 days
Minimum Stock	Center Standard	Center Standard
Maximum Stock	Center Standard	Center Standard
Safety Stock	Center Standard	Center Standard
Minmax Distributor	10 large distributors that center-to-center cooperation	10 large distributors that center-to-center cooperation
Order via Defekta	None	Exist
Delivery time of goods Defect	None	3-7 Days
Distributor Defekta	None	All distributors spread out across Indonesia
Frequency of defect	None	Every day, if needed
Order Cito	Business Unit Policy	As needed Pharmacy

SKU Addition	Can't add SKUs	Can add SKU
HR	Service focus	Service and control focus Item

Source: Researcher Observation Results (2022)

2. **Observation results of *inventory management Availability on* Pareto A, SKU, Age of Goods Inventory**

Table 2 shows data on the quality of inventory before and after optimization of the minmax method, where for pareto A *availability*, SKU in year 2022 compared to 2023 there is an increase. The age of inventory in 2022 compared to 2023 has decreased, so it can be said that the goods ordered by Kimia Farma Pharmacy Balikpapan are goods needed by the market.

Table 2. Observation Results for Minmax Variables

Month	Pareto A Availability 2022	SKU 2022	Age Inventory (days) 2022	Pareto A Availability 2023	SKU 2023	Age Inventory (days) 2023
January	80%	2511	61	95%	3228	48
February	81%	2639	47	96%	3379	43
March	82%	2407	78	97%	3340	42
April	80%	2386	82	95%	3286	42
May	83%	2326	63	96%	3499	36

3. **Observation Results of Non-Prescription Turnover Variables, Visits, Before and After Minmax Method Optimization.**

Table 3 shows the non-prescription turnover, and the visit changes before and after the optimization of minmax method, January-May in 2022 has not been done optimization of minmax method when compared with January-May 2023 turnover of Kimia Farma Pharmacy Balikpapan there is a significant increase in turnover. Visits in 2022 compared to 2023 have increased, this is due to an increase in the number of SKUs and the availability of Pareto A above 95%.

Table 4 shows that there is a significant increase in P1, P5, P6, P8 and P9 where these questions are related to the availability of goods at the pharmacy.

Table 3. Observation results for non-prescription turnover and visits

Month	Non-turnover Recipe 2022	Visit 2022	Non-turnover Recipe 2023	Visit 2023
January	852.487.010	7230	1.113.836.190	9312
February	895.073.837	9730	1.151.896.976	9209
March	823.504.852	7791	1.104.927.216	9200
April	717.685.372	6593	1.094.417.426	9632
May	770.016.441	7747	1.238.625.211	9851

Table 4. Average Value of Each Questionnaire Question Before and After Optimization of Minmax Method

Question	Before Optimization Minmax method	After Optimization Minmax method
P1	1,0	4,5
P2	3,2	5,0
P3	3,7	4,3
P4	4,0	4,0
P5	1,7	4,4
P6	1,0	4,6
P7	4,2	5,0
P8	1,6	4,5
P9	2,0	4,5
P10	4,0	4,8
P11	4,7	5,0
P12	4,2	5,0
P13	5,0	4,5
P14	3,0	4,6
P15	5,0	5,0
P16	3,5	4,0
P17	3,4	4,3
P18	3,6	5,0
P19	3,0	4,1
P20	4,2	5,0

4. Results of Testing Differences Before and After Minmax Method Optimization for Inventory Management Variables, Non-Reso Turnover, Satisfaction and Visits.

Table 5 shows that the average value of pareto A *availability*, SKU, inventory age, customer satisfaction, non-prescription turnover and visits before optimization with minmax method is lower than the average value after optimization, the t-test results also show a significant difference.

Table 5. Average, t-test results for pareto A *availability*, SKU, inventory life, customer satisfaction, Non-Prescription Turnover and Visits before and after optimization of the minmax method

Variables	Average minmax size		Value of t Count	Sig.	Description
	Before	After			
Pareto A *availability*	81,2	95,8	-36,50	0,000	There is a difference
SKU	2453	3346	-10,89	0,000	There is a difference
Inventory life of Goods	66	42	3,52	0,024	There is a difference
Customer Satisfaction	3,38	4,61	-84,199	0,000	There is a difference

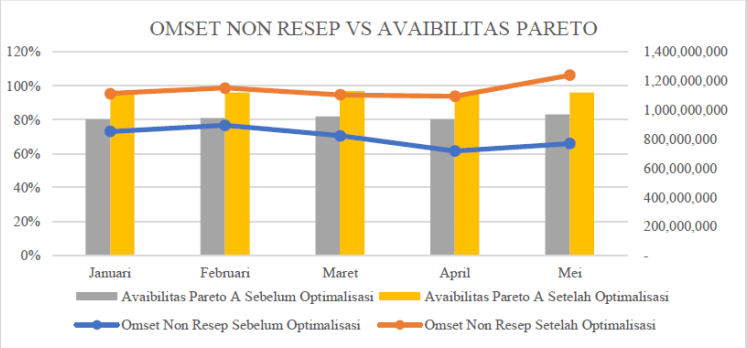
Non-Prescription Turnover	811.753.502	1.140.740.604	-8,000	0,001	There is a difference
Pharmacy Visit	7818	9440	-2,725	0,053	There is a difference

5. The relationship between optimization of the minmax method in inventory management and increased turnover.

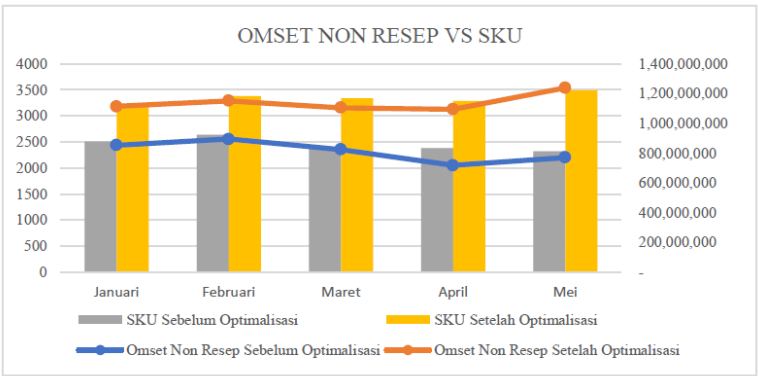
Figure 1 shows that the relationship between the availability of pareto A and the non-prescription turnover of the Kimia Farma Pharmacy Balikpapan. Inventory management in the form of pareto A availability has a relationship with increasing non-prescription turnover.

Figure 2 shows that the relationship between SKU and non-prescription turnover of the pharmacy of Kimia Farma Balikpapan. An increase in the pharmacy SKU can increase the non- prescription turnover of Kimia Farma Pharmacy Balikpapan.

6. The relationship between inventory management variables and customer satisfaction, turnover and visits



7. The relationship between customer satisfaction variables with turnover and visits



Optimization of the minmax method has an influence on inventory management at Kimia Farma Pharmacy Balikpapan, it can be seen from several indicators, namely Pareto A *availability* which is getting better, because pharmacy management always defects when the stock of goods has started to run low, so that *fast moving* category items are always maintained. In line with research conducted by

Hertanto (2020) that the minmax method is able to control inventory. If the inventory is too large, the capital used is getting bigger so that this can pose a risk of loss, whereas if the inventory is small, there will be a potential loss of turnover (Herawan et al., 2013).

As the SKU value increases, pharmacy management begins to plan for product additions by referring to rejections, recording rejections every day pharmacies will be able to read the market needed by the community around the pharmacy. In line with research conducted by Fure (2013) that product diversity is seen from the product categories available at a retail or supermarket company, where the market can be known based on its needs and uses which become consumption products, besides that it affects buying interest.

The age of inventory is getting shorter because it is related to optimal inventory control, the short age of inventory, the pharmacy management must pay more attention to the inventory of goods, so that the potential for loss of turnover is getting smaller.

8. Implementation of minmax at Kimia Farma Pharmacy Balikpapan as a method of managing goods in optimizing the inventory control function

Kimia Farma Pharmacy Balikpapan implemented the minmax method in early 2020, which is the central policy of PT. Kimia Farma Pharmacy with the aim of reducing high over inventory and expiration. In July 2022 optimization of the minmax method began to be implemented in order to prevent a shortage of goods. Some optimizations can be seen in table 1. In the optimization of the minmax method, an active role of human resources is needed in controlling goods and continuing to observe the availability of goods.

The success of minmax method optimization at Kimia Farma Pharmacy Balikpapan can be seen from the following indicators: Improved inventory quality (Table 2). The improvement of inventory quality of Kimia Farma Pharmacy Balikpapan before and after optimization is seen from the increase of pareto A availability, this shows that *fast moving* goods are maintained in stock. SKUs are increasing, this shows that the goods provided by Kimia Farma Pharmacy are increasingly varied, so that patients have many choices to buy the goods needed, research conducted by Saputra et al. (2023) states that Product diversity has a strong influence on high customer buying interest. The age of goods inventory is getting shorter, this shows that the goods ordered are those needed by the market around the Balikpapan Kimia Farma Pharmacy.

9. Effect of Minmax Method Optimization on Customer Satisfaction

The test results according to Table 5 optimization of minmax method has effect (Sig. 0.000 ≤ 0.05) on customer satisfaction, and according to Table 6 and Table 7 states that optimization of minmax method through inventory management variable has influence on customer satisfaction with strong correlation level. Kimia Farma Pharmacy Balikpapan is able to control the quality of inventory, so as to be able to

fulfill the patient's needs which causes to increase the customer satisfaction index, customers feel happy with the completeness and variety of goods carried out by the Balikpapan Kimia Farma Pharmacy because customer problems related to health can be resolved or get the right solution. Pasaribu & Sembiring (2012) stated that the variety and availability of products have a positive and significant effect on customer satisfaction. Patients also feel the impact of the optimization effect from before the patient was difficult to obtain drugs because they were always unavailable, after optimizing the minmax method for improvement of inventory management, the patient did not have difficulty obtaining the desired drugs. This is similar to research conducted by Hermawati (2013) which states that products have a positive and significant effect on customer satisfaction and loyalty.

Customer satisfaction increases because one of the factors is the availability of drugs needed at Kimia Farma Pharmacy Balikpapan. Nimako (2012) states that dissatisfaction affects customer complaints. This dissatisfaction also has a negative impact, which causes consumers to feel disappointed with the services or products provided by the pharmacy. Repeated consumer losses can lead to decreased revenue and harm long-term business. Disappointed and regretful consumers can look for alternatives and switch to pharmacy competitors that they consider better at providing services or products (Pujiah & Fatmawati, 2018). Consumers who do not satisfied may tell others about their bad experiences, either directly or indirectly. These negative reviews can create a bad image for the pharmacy and lower the trust of potential customers.

Pearson correlation test table 7 show that customer satisfaction has an influence on turnover and visits at Kimia Farma Pharmacy Balikpapan, therefore, customer satisfaction has a considerable influence or impact on turnover and visits. According to Maulana & Sukresna (2022) customer satisfaction is the main factor so that customers visit and repurchase products or services provided. Customer satisfaction also affects turnover where customers who feel happy with the service and hospitality will buy the products we offer regardless of the price offered (Kusumowardani, 2021). Ngo (2018) states that customer satisfaction is a very important indicator to see customers repurchase the products and services offered, happy customers will have the effect that the company will continue to survive in market changes because it has an impact on company revenue.

10. The Effect of Minmax Method Optimization on Pharmacy Turnover

The results of table 5 show that the optimization of the minmax method has a significant effect (Sig. 0.001 ≤ 0.05) on turnover. The average difference has increased by 40.5%, this shows a positive trend every month, the increase in turnover can be concluded that there is a positive progress in increasing turnover. In table 3, the highest turnover was reached in May 2023 while the lowest turnover was in April 2022, external factors affect these fluctuations, one of which is the *Lebaran* homecoming flow.

In Figure 1 and Figure 2, it can be seen that the availability of Pareto A and the

increase in the number of SKUs have an effect on increasing non-prescription turnover, the optimization of the minmax method has a considerable influence or impact on turnover, a positive trend, namely the increase in turnover every month after optimization shows the progress of increasing turnover. According to Khairunnisa et al. (2020) the greater the working capital invested by the company, the greater the turnover obtained from the sale of goods. Dewi & Utari (2014) state that capital has a positive effect on business income and turnover, the more capital a company invests, the positive effect it will have on company development such as creating a brand image, customer satisfaction and supporting business operations and most importantly increasing the income received.

11. The Effect of Minmax Method Optimization on Customer Visits

The results of table 5 show that the optimization of the minmax method has a significant effect (0.053 ≤ 0.05) on customer visits, while the pearson correlation test in table 6 states that the optimization of the minmax method through inventory management variables has an influence on turnover. Improving inventory management with the optimization of the minmax method has an impact on meeting the needs of customer medicines. If this happens continuously, the level of customer satisfaction continues to increase which will eventually reach the loyalty stage.

The availability of medicines in the pharmaceutical retail business is an important factor in determining customer purchasing intensity, providing products that fall into the pareto category is an effort made by pharmacies. Pharmacies try to make it easy for customers to always continue to provide products that are in the pareto category, this aims to improve the quality of service provided. The action is taken so that customers do not feel disappointed and it is also a form of evidence of *excellent* service provided by the Balikpapan Kimia Farma Pharmacy. Customers will be loyal if they feel that the need for medicines they consume is a routine thing even though the distance is quite far. The availability of pareto products at the Balikpapan Kimia Farma Pharmacy, then it will affect consumer interest in making repeat purchases. Kotler (2005) stated that one of the factors that influence consumer repurchase interest is due to product availability factors. Consumers will be satisfied if the product is as expected so that it will affect consumer repurchase interest in the product. Repurchase interest for consumers after using a product is the key to the success of a business, a company survives because the company has a group of customers. Ermawati (2012) in her research states that product availability affects purchase intensity.

D. CONCLUSIONS

The conclusion of this research can be concluded that Optimization of minmax method is successfully applied by Kimia Farma Pharmacy Balikpapan. Increased customer satisfaction index, turnover and visits because the needs are served.

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