

Improving Modern Port Competitiveness by using Data Mining to Obtain Strategic Decision

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Abstract: Modern port management nowadays is a demand in the global era. Port services are consist of various kind, among them, there are many customers that need to be understand. It is important to define customer attribute and behavior to drive port's profitability. In this study, RFM (Recency, Frequency, Monetary) is one kind of data mining technique used to analyse customers based on their buying behavior. With this method, high-to-low response customers can be identified. The result of this study is expected can help the management in a decision making process in order to improve services development, customer service customization and competitiveness of the company.

Keywords: Decision Support System, Data Mining, RFM, Customer Relationship

Introduction:

Modern port management nowadays, the speed and accuracy of goods delivery in fact being a bet in order to succeed the development of an archipelago country like Indonesia. There are many kinds of port services, such as shipping services, cargo handling, and container services. Each of them consist of many customers that have each of their own behavior. It is important to understand their behavior. Better services such as customer service customization, targeting customer, and services development improvement can be build if the company understand it well. RFM (Recency, Frequency, Monetary) analysis can be used to characterize customers behavior. By understanding it, management of the port company can obtain better strategic decisions to treat their customer than before and improve their competitiveness level to a new high. There is no doubt that if a company wants to keep its advantage, it needs not only to attract new customers, but also to keep and maintain old valuable ones [5]. Data used in

this study presented on anonymous. Further explanation of RFM is presented in section 2. Meanwhile, implementation of RFM to make customer profilings will be discussed on section 3. On the section 4, the result of RFM analysis is described. Conclusion of this study will be stated on section 5. SPSS 17 is used as a tool to help the RFM calculation process.

RFM Analysis:

RFM is a method of segmenting customers on their buying behavior. Its use is primarily for improving the efficiency of marketing efforts to existing customers. It is a very powerful tool that involves little more than creating segments from the three groups. [4]

RFM analysis is a three-dimensional way of classifying or ranking customers to determine the top 20% or it can be said as best customers. It is based on the 80/20 principle that 20% of customers bring in 80% of revenue [1]. RFM analysis uses information about customer past behavior that is easily tracked and readily available. [3]

Recency is the number of months since the last purchase occurred. It is typically the most powerful of the three characteristics for predicting response. It is said that if people recently purchased something from a company, they are more likely to make another purchase than someone who did not recently make a purchase [4].

Frequency is how many purchases the customer has made within a specified time period. Meanwhile, monetary is total money spent by the customer, again, in a specified time period. [3]. These three characteristics can be used alone or in combination with other characteristics to assist in CRM (customer relationship management) efforts [4].

In order to group customers and perform analysis, a customer model known as pyramid model is used. The pyramid model groups customers by the revenue they generate into categories as shown in Fig. 1. The advantages of this approach is that it focuses the analytical process on categories and terminology that can be meaningful for business, such as decision making, prediction concerning of customer's position alteration in the pyramid, knowing the inactive customers, and so on.[1].

The pyramid model split customer into five segments. If RFM combined with pyramid model, there would be five segments on each of recency, frequency, and monetary factors.

Customer Profiling by using RFM Analysis:

RFM can be used not only on catalog or merchandise company but also on services company. This study will take place on a modern port company. This company move on port services business, domestic and international purposes. There are various kinds of port services. It included ships services, cargo services, and container services [2]. This study just take definition of customers in general meaning, it is not specific on the deep definition kind of customers like people who used the ships as passengers, or how many containers that filled the ship. It can be said that customers are ships departed and make transactions on the port. Definition of recency on the

case study is the number of months in the last 18 months since the last transaction occurred by the ship. Frequency is how many times ship has visited. It is limited from 5 to 50 visit in the last 18 months. Monetary value is total amount of money spent by the ship while making transactions on the port. Data used for test purpose retrieved from random data of company's database. By selecting random sample of customers, it hope that all types of customers would be presented, both recent and not so-recent customers, frequent and less-frequent customers, also range of customers that spent their money to get the port services. Objective of this study is to use the results of test to identify which groups of customers are more likely to respond. Customer segmentation begins with find a distribution of customers in general pattern. Table-1 shows about category of customer (ship) based on their recentness of visiting the port. Table-2 tells about how frequent the ship visit the port. Monetary factor range are spreads from to 250 million rupiahs. After split customers into several category like on pyramid model, next steps is use SPSS 17 to calculate the RFM score. In this version of SPSS, it has a feature to make the analysis process become easier. There are two kind of RFM analysis on SPSS 17. It is based on transaction datas or customer datas. This study using the second option, using customer datas. Fig. 2 shows what data need to be filled in order to do the process. By completing the pre-requisite datas, RFM analysis can be done.

Experimental Result:

RFM Analysis tools of SPSS 17 will have several results, such as:

- Recency_score
- Frequency_score
- Monetary_score
- RFM_Score

From the 100 datas used in this test, the results are categorized in pyramid model, presented in Fig.3 for Recency score chart, Fig.4 tells about frequency score chart, Fig.5 shows about the monetary score. Besides of three of these reviews, there is a combination of three of them, it called RFM

score or RFM index. This index can be easily collected on append each of R,F,M score for each of customer. For example, if R=1, F=3, and M=4 then RFM score=134. Fig.6 shows that there are 5 major categories formed from the combination of RFM factors. Furthermore, Fig.7 shows the summarize of RFM score in categorical. category=1 identical with 'inactive' on pyramid model and category=5 is the same as 'top' on pyramid model.

Conclusion:

The following conclusions are deduced from the experimental results:

- Customer behavior can be identified by using RFM to find their characteristic from their habit of visiting the port.
- RFM was shown to be effective approach for predicting responses.
- RFM can be used to support the customer relationship program as part of strategic planning of the company
- By using RFM analysis, segments of customer can be identified. It said that from 100 of customers, the company has about 41% of loyal customer and moderate customer about 19% and small potential customer is about 40%. Almost half of them. It means that company do not need to waste their energy to keep these unpotential customers.
- By understanding behavior and characteristics of customers, the company can plan a special service to keep the loyal customers and better services to retain moderate customers.

Future Research:

As in any research, our study has its limitation. Further study is needed to see if the result of RFM can be combined with other methods, or make a deeper RFM analysis for each kind of port services and comparison from one another.

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References:

- [1] Aggelis, Vasilis et al (2005). Customer Clustering using RFM Analysis, ICCOMP'05 Proceedings of the 9th WSEAS International Conference on Computers. ISBN:960-8457-29-7.
- [2] Budiyo, Eko Hariyadi et al (2007). Manajemen Bisnis Pelabuhan, PT. Andhika Prasetya Ekawahana, Surabaya, Indonesia.
- [3] Mason, Charlotte (2003). Recency, Frequency and Monetary (RFM) Analysis. Kenan-Flagler Business School, University of North Carolina
- [4] Rud, Oliviar Parr. (2001), Data Mining Cookbook, Willey & Sons, Canada.
- [5] Wang Hei-Chia et al (2006). A Web Service for Evaluating an e-Commerce Site: Mining On-Line Customers' Preferences. IJCSNS International Journal of Computer Science and Network Security, Vol.6 No.7B, July 2006.

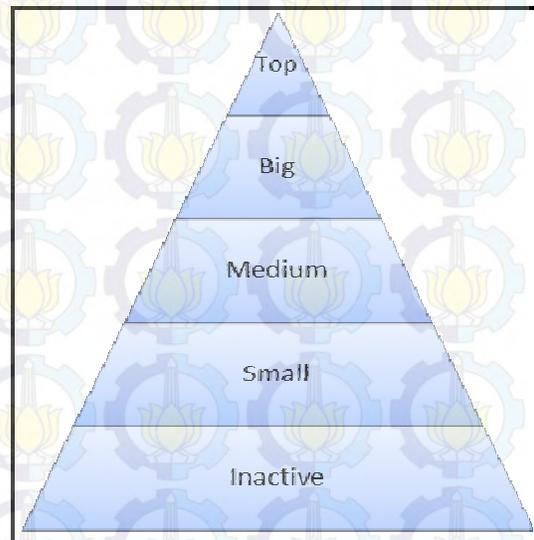


Figure 1: Pyramid Model

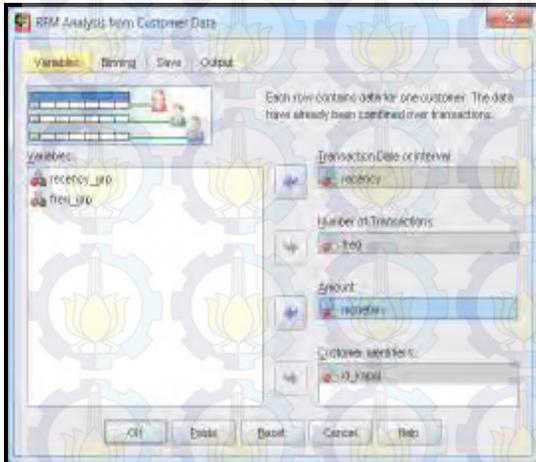


Figure 2: RFM Analysis using SPSS 17

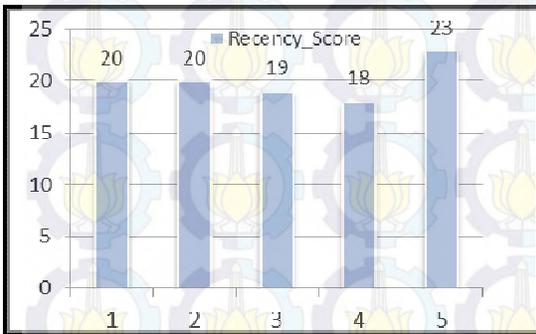


Figure 3: Recency Score

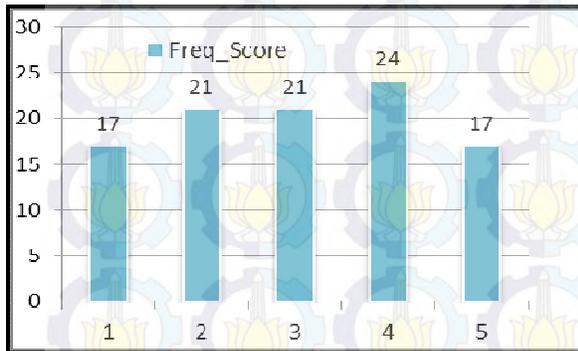


Figure 4: Frequency Score

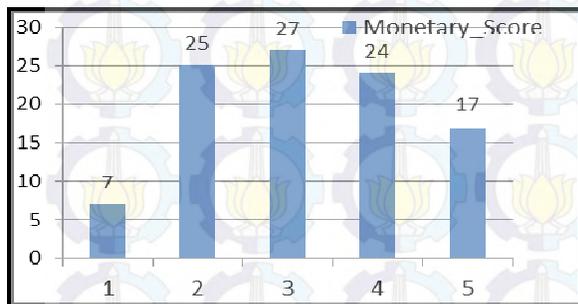


Figure 5: Monetary Score

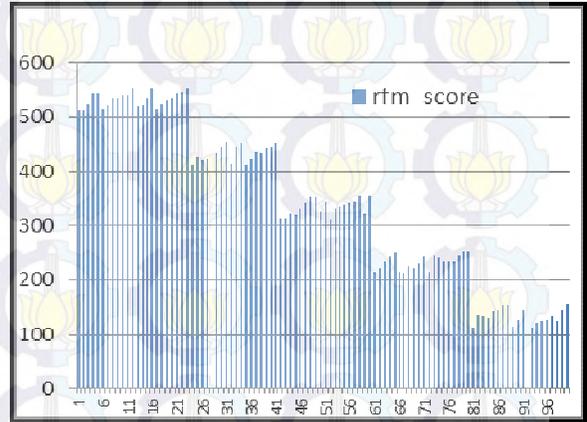


Figure 6: RFM Score Result

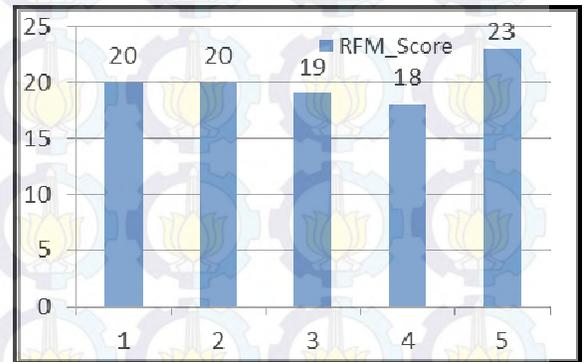


Figure 7: RFM Score Summarized

Table 1: Recency of Visits

type	last transaction	category
5	0-1 months	top
4	2-3 months	big
3	4-7 months	medium
2	8-12 months	small
1	13-18 months	inactive

Table 2: Frequency of Visits

type	Frequency of transaction	category
5	46-50	top
4	31-45	big
3	16-30	medium
2	11-15	small
1	5-10	inactive