



**IMPLEMENTASI ALGORITMA CLUSTERING DAN
ASSOCIATION RULE MENGENAI STRATEGI PENGEMBANGAN
LEMBAGA AMIL ZAKAT (LAZ) DI BAITULMAAL MUAMALAT**

TUGAS AKHIR

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**UNIVERSITAS
MERCU BUANA**
**PROGRAM STUDI TEKNIK INFORMATIKA
FAKULTAS ILMU KOMPUTER
UNIVERSITAS MERCU BUANA
JAKARTA
2021**



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2021

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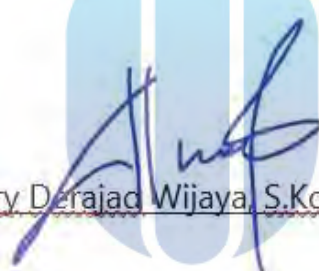
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ABSTRAK

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Pembimbing TA : Leonard Goeirmanto, Dr., ST, M.Sc
Judul : Implementasi Algoritma Clusterring dan ssosiation
Rule Mengenai Strategi Pengembangan Lembaga
Amill Zakat (LAZ) Di Baitulmaal
muamalat.....

Pada penelitian ini pendekatan data mining dimanfaatkan dalam pembuatan kerangka pengambilan keputusan untuk pemasaran presisi menggunakan metode RFM (Recency, Frequency, Monetary), algoritma K-Means Clustering, sebagai metode pertama untuk pengelompokan data donatur menjadi beberapa cluster sehingga menghasilkan labeling kelompok low dan kelompok high. Dan tahap selanjutnya akan di kombinasi antara algoritma assosian rule dengan software yang di gunakan rapidminer dan Rstudio. software Rstudio digunakan untuk mencari jumlah cluster yang paling optimal untuk proses clustering. Software Rapidminer digunakan untuk mengelompok kan atau mengklaster donatur dan juga digunakan untuk melihat asosiasi berupa pola atau hubungan kelompok donatur dengan program yang ditawarkan, sehingga dapat diciptakan dengan menerapkan strategi pemasaran atau marketing maps. Hasil pengujian nya ditampilkan dalam bentuk tabel.

Kata kunci: K-Means Clustering, Association Rules, RFM.

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ABSTRACT

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Title : Implementasi Algoritma Clusterring dan
Assosiation Rule Mengenai Strategi Pengembangan
Lembaga Amil Zakat (LAZ) Di Baitulmaal
Muamalat.....

In this study, the data mining approach is used in making a decision-making framework for precision marketing using the RFM (Recency, Frequency, Monetary) method, the K-Means Clustering algorithm, as the first method for grouping do-natur data into several clusters resulting in low and low group labeling. high group. And the next stage will be a combination of the association rule algorithm with the software used by Rapidminer and Rstudio. Rstudio software is used to find the most optimal number of clusters for the clustering process. Rapidminer software is used to group or cluster donors and is also used to see associations in the form of patterns or relationships of donor groups with the programs offered. So that they can be created by implementing a marketing strategy or marketing maps. The test results are displayed in the form of a table.

Key words: K-Means Clustering, Association Rules, RFM.



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Penulis menyadari masih banyak kekurangan pada penulisan tugas akhir ini, baik teknik penelitian, cara penjelasan, maupun penulisannya. Oleh karena itu, kritik dan saran yang membangun sangat diharapkan. Penulis berharap tugas akhir ini dapat memberikan manfaat bagi para pembaca.

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NASKAH JURNAL

IMPLEMENTATION OF CLUSTERING ALGORITHM AND ASSOCIATION OF RULES REGARDING THE DEVELOPMENT STRATEGY OF AMIL ZAKAT INSTITUTION (LAZ) IN BAITULMAAL MUAMALAT

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Abstract - In this study, the data mining approach is used in making a decision-making framework for precision marketing using the RFM (Recency, Frequency, Monetary) method, the K-Means Clustering algorithm, as the first method for grouping do-natur data into several clusters resulting in low and low group labeling. high group. And the next stage will be a combination of the association rule algorithm with the software used by Rapidminer and Rstudio. Rstudio software is used to find the most optimal number of clusters for the clustering process. Rapidminer software is used to group or cluster donors and is also used to see associations in the form of patterns or relationships of donor groups with the programs offered. So that they can be created by implementing a marketing strategy or marketing maps. The test results are displayed in the form of a table.

Keywords: K-Means Clustering, Association Rules, RFM.

I. INTRODUCTION

The problem of poverty and unemployment is a fundamental problem that has become the center of attention of governments in any country. This problem is not only seen from the indicators of fulfilling consumption and basic human needs, but also from the fulfillment of future guarantees, September 2013, March 2015 and March 2020. The development of poverty levels from 2006 to March 2020. According to the Central Statistics Agency, it was noted that The percentage of the number of poor people in Indonesia in March 2019 started a decline reaching 24.79 million people. But in March 2020, the number of poor people increased by 26.42 million people. the number of poor people decreased by 1.63 million people. This is a big problem, and until now the

government continues to strive to reduce the poverty rate. So that the increase in the number and percentage of poor people in that period was triggered by an increase in the price of basic necessities as a result of the increase in fuel prices and the Covid-19 pandemic in March 2020. Solving the problem of poverty, unemployment and other socio-economic problems cannot be done only by through temporary plans in the short term, but must be addressed in an integrated manner with long-term social security programs. These problems are not only the responsibility of the government, but an institutional role of society is needed to prepare them for a structured and sustainable social welfare development system. Seeing the challenges to help solve these socio-economic problems so that non-governmental institutions such as amil zakat institutions must be able to optimize their role in these problems.

Efforts to increase the satisfaction and loyalty of donors at amil zakat institutions need a customer relationship management (CRM) strategy as a way of marketing, maintenance and a proportional approach to donors, while the CRM analysis carried out includes customer identification, marketing targets, loyalty to programs and development. customers (donors) so that marketing maps can be done to make the final result in this research process.

II. RESEARCH METHODS

2.1 System Requirements Analysis

The data mining approach is utilized in making a decision-making framework for precision marketing using the RFM (Recency, Frequency, Monetary) method, the K-Means Clustering algorithm, as the first method for grouping donor data into several clusters. K-means clustering is a non-hierarchical clustering method that partitions data into one or more groups, where data that has the same characteristics will be grouped into the same group, and data that has different characteristics will also be grouped into groups. different. In this study, a combination of the K-means clustering algorithm, Assosian Rule, FP-Growth will be used, with the software used by Rapidminer and Rstudio. Rstudio software is used to find the most optimal number of clusters for the clustering process. Rapidminer software is used to group or cluster donors and is also used to see associations in the form of patterns or relationships between groups of donors and programs offered, and programs with programs. In this study, three algorithms will be used in determining priority, including :

- K-means
- Assosian Rule
- FP-Growth

Apart from the three algorithms above, this system also applies several technologies to help the process of handling this Donor strategy handling system

2.2 Architecture

This system is an association process that is carried out on modeling which is carried out in accordance with the cluster groups that are formed namely :

1. The Association of Elective Programs in the Low Group
2. The Association of Elective Programs in the High Group

From the results of the analysis, data processing is made into a Marketing Maps analysis or marketing map that aims to see target donors, transaction patterns towards the programs offered and donor development based on the linkages between programs..

Several algorithms and frameworks are used in this system, among others :

TABLE I framework

Algoritma/Framework	Scope	Information
Program R	Statistic analysis	<i>As determining the optimal cluster</i>
K-means	Clustering	<i>To determine the grouping of donors</i>
Assosian rule	Combination of items	<i>As determining the program to be selected</i>
FP-Grwoth	Frequent itemset	<i>Determine which data sets appear frequently</i>

2.3 Marketing Maps Analysis

Analysis of Marketing Maps or marketing maps is an analysis of the results of data processing with the Association Rules method which aims to see target donors, transaction patterns towards programs and donor development based on the linkages between programs.

2.3.1 Specifying Variables

This determinant variable is the selection of data attributes from which donor transactions are selected, which includes; recency, frequency, monetary (last transaction by month, frequency of transactions, amount of money in transactions). The data used in this study are transaction data for 2017 - 2020 with a total of 227,092 donors stored in Microsoft Excel format.

TABLE II Donor Data

ID	RECENCY	FREQUENCY	MONETARY
Donor 1	1-Jan-17	1	165,810.06
Donor 2	2-Jan-17	103	83,099,037.05
Donor 3	3-Jan-17	74	15,714,515.96
Donor 4	5-Jan-17	183	135,908,052.46
Donor 5	6-Jan-17	2	381,406.70
Donor 6	8-Jan-17	9	571,420.58
Donor 7	11-Jan-17	10	62,957,039.56
Donor 8	13-Jan-17	37	13,594,639.00
Donor 9	17-Jan-17	169	219,789,524.00
Donor 10	20-Jan-17	18	7,069,800.00

Comparison of Clustering Algorithms this section is carried out based on the existing parameters for grouping donors using the non-hierarchical K-means method and kmedoids. As for the data taken from Baitumaal Maumalat in the form of attributes that have been processed with the RFM Model.

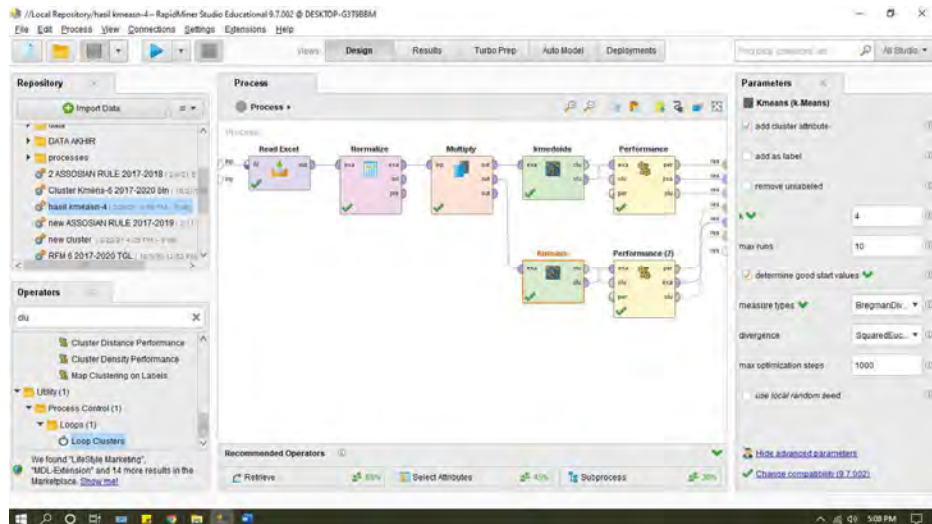


Figure . I Cluster Comparison

In the comparison section, K-means and kmedoids use DB, where the smaller the number the better the interest of the equation to become a cluster group, meaning that the value is the best K value in the clustering algorithm.

TABLE III Comparison

Kmeans	Kmedoids	value - K
0.755	0.522	k-2
0.215	0.413	K-3
0.187	0.404	K-4
0.194	0.546	K-5
0.206	0.482	K-6
0.193	0.796	K-7
0.187	1.193	K-8

In this table it is known that the best value of Davies Bouldin (DB) kmedoids with cluster 4 is 0.404, whereas in K-means the best value is in cluster 4 with a result of 0.187.

2.3.2. Cluster selection

For k-means analysis is a non-hierarchical analysis, then the value of k is determined by the researcher, here previously used the value of $k = 4$, but to prove that the value of k used is optimal, you can compare 2 methods, namely the wss, sillhoutten method

```

install.packages("stats")
install.packages("dplyr")
install.packages("ggplot2")
install.packages("ggfortify")
install.packages("wssplot")

library(cluster)
library(tidyverse)
library(factoextra)

data<-read.csv(file.choose(), header = TRUE)
View(data)
plot(data)
data=data.frame(data[1:3])
datafix <- scale(data)
fviz_nbclust(datafix, kmeans, method = "wss")
fviz_nbclust(datafix, kmeans, method = "silhouette")
dim(data)

```

Figure. II. Rstudio

2.3.3 Proses Clustering Dataset

After obtaining the optimal K-means, the clustering process itself is carried out after the data is transformed in the form of normalized modeling into the Z-Score form so that it is clustered and tested for performance to find out within centroid distance or in the form of an average.

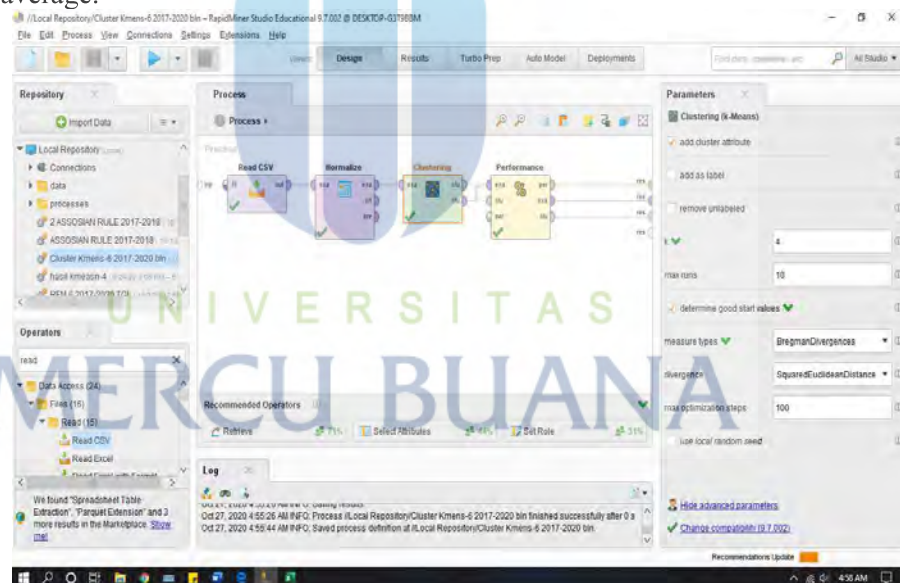


Figure.III Clustering Kmeans

2.3.4 Clustering Based on RFM Attributes

The results of clustering can be seen in the Rapidminer "data view" table. Based on the clustering process, the following groups are obtained: Cluster Model

1. Group 1 (low) There are 812 donors (90.38%)
2. Group 4 (high) There were 81 donors (9.97%)

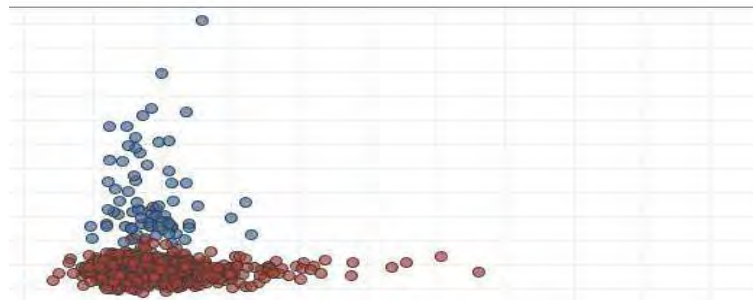


Figure.IV Visualization

The cluster results obtained will be given a name label according to the behavior of the donor where for cluster 0 or group 1 will be labeled as the low group and cluster 1 or group 2 will be labeled as the high group.

2.3.5 Program Association

This process aims to see the target donors for the donation program offered by amil zakat institutions in the form of associations. The clustering process that was previously carried out resulted in data in the form of donors in their respective groups or clusters. The data does not include the program variables chosen by the donor, therefore before carrying out the relationship process it is necessary to merge the dataset again, namely entering the donation program variables selected by the donors.

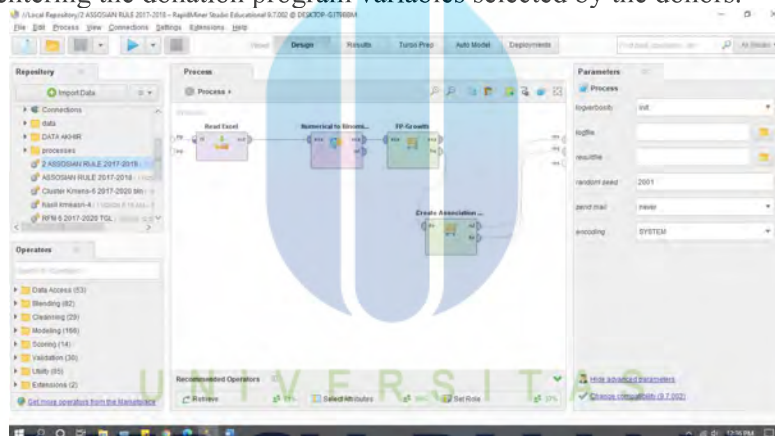


Figure. V Association

2.3.6 Association of Preferred Programs in the Low Group

This data processing aims to see the relationship between one program and another as an effort to develop program offerings, the following are the results of data processing with Rapidminer software, with minimum support parameters: 0.01 and minimum configuration: 0.4 Out of 812 transactions then an association that has a value is taken. confidence, the following associations are obtained:

[Humanity = Humanity] 56 -> [Economy = Economy] 8 conf: (0.57)

This association is related to humanitarian and economic programs, the category emerged with 56 transactions by selecting humanitarian programs, while the 8 donors also simultaneously chose economic programs with a value level (0.57), which means that all transactions selected a humanitarian program would definitely choose an economic program 57% .

[Health = Health] 66 -> [Economy = Economy] 8 conf: (0.58)

This association is a relationship with the health program and the economy, the category appears with 22 transactions by choosing a health program, while 1 donor also simultaneously chooses an economic program with a value level (0.58) which means that

all transactions definitely choose the Health program definitely choose the economic program 58%.

2.3.7 Association of Preferred Programs in the High Group

This data processing aims to see the relationship between one program and another as an effort to develop program offerings, the following are the results of data processing with Rapidminer software, with minimum support parameters: 0.01 and minimum configuration: 0.4 From 81 transactions then an association that has a value is taken. confidence, the following associations are obtained:

[Advocate = Advocate] 28 -> [Humanity = Humanity] 16 conf: (0.97)

This association is a relationship with advocate and humanitarian programs, the category appeared with 29 transactions by choosing an advocate program, while the 16 donors also simultaneously chose humanitarian programs with a value level (0.97), which means that all transactions must choose an advocate program, definitely choose a program of concern, definitely choose a program of concern. humanitarian program 97%.

[Economy = Economy] 16 -> [Health = health] 1 conf: (0.82)

This association is a relationship with economic and health programs, the category appears with transactions 15 by choosing an economic program, while 1 donor also simultaneously chooses a health program with a value level (0.93), which means that all transactions must choose the economic program 93%.

III. RESULTS AND DISCUSSION

In marketing, there is a process where the company creates value for customers to satisfy consumer needs and that value can be created by putting together marketing maps that aim to see target donors, transaction patterns of programs offered and donor development based on inter-program linkages. The identification of each cluster group is as follows:

3.1 Low Group Program Association

This class is a group of donors with a low group label because in general donors only make transactions three times in three and a half years. It can be concluded that if the donors of this class do not have a strong relationship with the institution, it can be seen from the average amount of money donated. right, this group has an average nominal amount of funds of Rp. 117,989,150 in three and a half years, whereas based on the last transaction, this group or low class has a tendency of transactions in February. Judging from the number of donors, this group has 812 (90.038%) donors and forms the largest number of groups that are constantly increasing but less potential to become regular donors or who carry out transactions on a regular basis.

TABLE IV Association and Confidence

Association	Confidence
[Advocate = Advocate] -> [Economy = Economy]	0.55
[Humanity = Humanity] -> [Economy = Economy]	0.56
[Education = Education] -> [Economy = Economy]	0.56
[Health = Health] -> [Economy = Economy]	0.58
[Economy = Economy] -> [Health = Health]	0.82
[Advocate = Advocate] -> [Health = Health]	0.73
[Humanity = Humanity] -> [Health = Health]	0.8
[Advocate = Advocate, Economy = Economy] -> [Health = Health]	0.81
[Education = Education, Health = Health] -> [Humanity = Humanity]	0.54

[Education = Education, Health = Health] -> [Advocate = Advocate]	0.54
[Education = Education, Advocate = Advocate] -> [Health = Health]	0.78

3.2 High Group Program Association

This class is a group of donors with the high group label specifically having an average of five transactions in three and a half years. It can be concluded that if the donors of this class have strong ties to the institution, it can be seen from the average amount of money donated. yes, this group has an average nominal amount of funds of Rp. 517,837,225 in three and a half years, whereas based on the latest transactions in this high group there was a trend of transactions in January. Judging from the number of donors, this group has donors with a total of 81 (9.97%) and forms the smallest number group that is always increasing and has the potential to become permanent donors or who carry out transactions regularly.

TABLE V Association and Confidence

Association	Confidence
[Humanity = Humanity] -> [Advocate = Advocate]	0.93
[Education = Education] -> [Advocate = Advocate]	0.93
[Education = Education] -> [Health = Health]	0.8
[Advocate = Advocate] -> [Humanity = Humanity]	0.96
[Advocate = Advocate] -> [Education = Education]	0.96
[Humanity = Humanity, Education = Education] -> [Health = Health]	0.8
[Humanity = Humanity, Education = Education] -> [Advocate = Advocate]	0.93
[Humanity = Humanity, Advocate = Advocate] -> [Education = Education]	0.1
[Humanity = Humanity, Health = Health] -> [Education = Education]	0.1

IV. CONCLUSION

This study produces the best number of clusters, namely two clusters with the RFM model, where the RFM values are obtained based on processed transaction data. The results of the RFM are reprocessed to determine the cluster using rstudio and rapidminer applications as the application of the K-means algorithm, starting from finding the optimal cluster and standardizing data to Zscore to producing clusters, namely Cluster 1 totaling 819 donors, cluster 2 totaling 81 donors. Furthermore, the application of target donors to the donation program resulted in high and low labeling. So that analysis can be generated based on the characteristics of donors to form 2 segments, namely Cluster 1: Low group with a maximum average of one transaction per year with 90.38% and Cluster 2: High group with an average of more than one transaction per year. with 9.97% So that the analysis can be used as material in making a marketing strategy or marketing maps that are more optimal because they are in accordance with existing data.

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The results of this research are expected to be used in the Baitumaal Muamalat institution, as a reference or analysis to further expand the research by adding attributes or other variables to donors and developing using other optimization methods or by selecting features for the accuracy of attribute completion.

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KERTAS KERJA

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