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Implementation Of K-Means Clustering Method In Grouping Best-Selling Building Materials At Sinar Harapan Building Shop

Aldevia Fadila [1]; Anisya Sonita [2]; Harry Witriyono [3]; Muhammad Husni Rifqo [4]
[1,2,3,4] Universitas Muhammadiyah Bengkulu
Email: [1] aldeviafadila406@gmail.com ;[2] anisyasonita@umb.ac.id ;[3] harrywitriyono@umb.ac.id ;[4] mhrifqo@umb.ac.id

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Abstract. Building materials are all materials both as basic and auxiliary materials needed to build a certain building that are easily available in building stores, one of which is at the Sinar Harapan Building Shop. The purpose of this research is to build a system that can provide information on building materials that are in demand and not in demand by applying the k-means clustering method to help facilitate the management of building material sales. The results of this study have created a system for classifying in-selling and out-of-selling building materials based on the results of calculations using the k-means clustering method by testing 10 samples of building materials which get the results of 3 in-selling building materials and 7 building materials not in demand or less in demand.

Keywords: *Grouping, Best-selling Building Materials, K-Means.*

INTRODUCTION

Building materials are all materials both as basic and auxiliary materials needed to build a particular building. Building materials are very easy to find in various building stores. One of them is Toko Bangunan Sinar Harapan, which is one of the stores in Bengkulu City, Bengkulu Province. This building shop is one of the large building shops that is quite crowded which requires the availability of complete building materials. This building shop sells various building materials such as wood, sand, stone, building equipment and many more.

The problem that occurs in this store is related to the overflow of building materials that are less in demand but are still added. This is actually based on the process of goods management which is still done conventionally or manually, namely by recapitulating the results of sales transactions and then seeing the number of building materials available, then adding building materials that are starting to decrease. So that the store does not pay attention to the priority of which building materials are in demand and which are less in demand. The process is deemed inappropriate, because the store in adding building materials is only based on the inventory of building materials that will run out. If the inventory of building materials will run out, the store will make the sale as before. Sometimes building materials that have a small number of sales are still being sold and even added, even though there are building materials that are in demand, the number of which must be added a lot. This results in building materials that are less in demand sometimes experiencing accumulation and building materials that are in demand sometimes lacking in quantity.

To solve this problem, a system is needed that can assist in analyzing in-selling and out-of-selling building materials to manage the sales management of building materials later. One of them is by utilizing Data Mining. Data mining has a technique for analyzing data to explore hidden information in large and complex amounts, so as to produce output in the form of

characteristics or patterns from certain data, one of the data mining techniques is group analysis which is better known as clustering. Clustering is a data analysis method whose purpose is to group data with the same characteristics into the same area.

One of the approaches used in developing clustering methods is the K-Means Clustering method, where this method is one of the data clustering methods that seeks to partition data into the form of two or more groups (clusters) with the same characteristics put into the same group. In this method, building materials will be grouped into categories of in-selling and non-selling building materials which are calculated based on sales data.

LITERATURE REVIEW

Based on the research to be carried out, references from several previous studies are very important in conducting a study with the aim of knowing the relationship between the research to be carried out and previous research, so that by adding these references it can avoid mistakes. In this study, several previous studies were taken to be references in making this research, these previous studies include.

The first study entitled "Implmentation of the K-Means Method for Clustering Final Project Recommendations", this study aims to recommend TA research areas for students based on A, B and C grade data on 10 Mandatory Courses (MKW) obtained during 6 semesters for the 2015, 2016, 2017 and 2018 batches of Informatics Study Program students, Faculty of Engineering, Mulawarman University. Clustering analysis using the K-Means method. Based on the experiment, clustering of the TA research area was carried out with 3 clusters (C), namely C1 is few, consisting of 1 MKW; C2 is medium, consisting of 6 MKW; and C3 is many, consisting of 3 MKW has been obtained. Cluster accuracy testing using the Sum of Squared Errors (SSE) method of 0.6566 and the Silhouette Coefficient (SC) method of 5.8329 has been obtained. This shows that the MKW value also has an influence in determining TA (Haviluddin, 2021).

The second research entitled "Application of the K-Means Clustering Method to Group District or City Food Crop Resilience in North Sumatra Province", the focus of this research is on grouping food crop resilience, based on data from the North Sumatra Central Statistics Agency which records all district and city food crops in North Sumatra Province such as: rice, corn, soybeans, cassava and sweet potatoes which vary in number. For this reason, it is necessary to group districts and cities to find out the highest or lowest potential food security areas. Therefore, a method is needed to facilitate the grouping of potential food security areas. With the K-means clustering approach, the division of regional groups can be done based on harvest area (Ha), production (tons), and planting area (Ha). The use of K-means clustering aims to facilitate the grouping of an area with the highest, medium, and low food security (Fani, 2019).

The third study entitled "Analysis and Application of Data Mining to Determine the Cubication of Water Sold Based on Customer Grouping Using the K-Means Clustering Algorithm", this study aims to determine how much water cubication is sold from customer water sales data to obtain information that is useful for employees in grouping customers based on their type. In managing the data we use the Data Mining method with the k-means clustering algorithm. Data Mining is extracting information from large amounts of data. The resulting information is in the form of groups of customer names whose water usage is classified as wasteful, moderate and economical, so the PDAM Kab.50 Kota can find out how many customers use wasteful water so that they can follow up. Testing is carried out using the RapidMiner application, so that clusters of customers whose water usage is wasteful, moderate and economical can be determined (Sri, 2016).Based on the three studies above, it can prove that the k-means clustering method is very suitable for grouping data, one of which is in this study which is used to group data on in-selling and less-selling building materials.

METHODS

The system development method applied in this research is the waterfall method. The waterfall method is a systematic and sequential information system development model. The Waterfall method has the following stages:

1. Requirements:This stage will analyze the desired system requirements and also collect the data needed to support the process on the system.
2. System Design:This stage will prepare all the software needs that support the creation of the system. Furthermore, the system display design will be made.
3. Implementation:At this stage the design that has been made is carried out the process of making the system by coding the program using a programming language.
4. System testing:This stage will test the system that has been made on the input and output aspects of the system to see if the system still has errors or coding errors.
5. Operation:At this stage, a presentation of the finished system will be made to the system users or it can also be called the program demo stage.

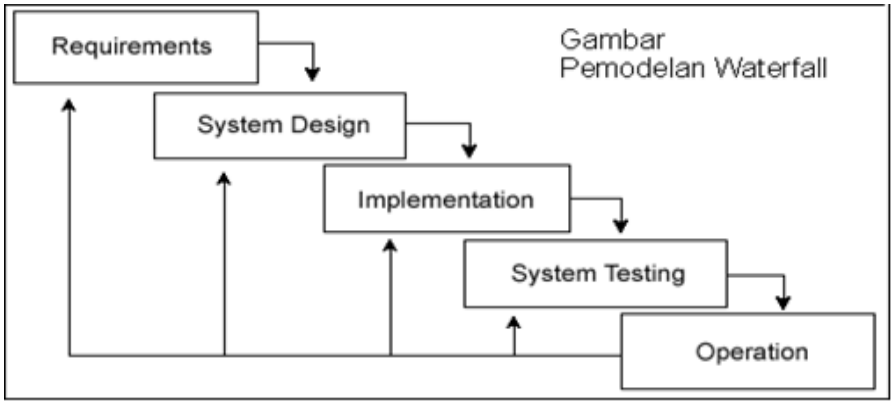

Figure 1 Waterfall Method

Data Collection Method

1. Observation
   Conducting direct research on the focus of the research, namely the Sinar Harapan Building Shop to find out things related to the research process. This hold also collects data on the sale of building materials.

2. Interview
   Conduct interviews directly with owners or staff related to research regarding research and additional information related to research.

3. Literature Study
   In the literature study, information is collected to obtain supporting theories in research and related to the issues raised in the study. This is studied in the literature study, among others, regarding previous research, building materials, data mining, clustering, k-means method, php programming language, database, DFD and ERD.

RESULTS AND DISCUSSION

The result of This research has created a grouping system for building materials. grouping system at Sinar Harapan Building Shop. The system consists of several pages, which include the following.

1.Login Page

Figure 2 Login Page

Figure 2displays the login page of the best-selling building grouping system at the Sinar Harapan Building Store.Building Sinar Harapan. On this page the system admin will be asked to fill in the username and password to enter the page. The display of this pagewill appear a background image about the system and also a filling form to login to the system.

2.Home Page

Figure 3 Home Page

Figure 3 is a home menu page where on this page the program will display a header.header there are several menus including home, building materials, sales,grouping, admin and logout. At the core of the page there is text about the system.

3.Building Materials Page

Figure 4 Building Materials Page

Figure 4 is a building material data table page, on this page will display the building material data table where the table consists of data stored in the database, namely the number, name of building materials, type, brand, stock and stored in the database, namely number, name of building material, type, brand, stock and action. action. There is an input button to enter the add building material data page and buttons to delete and edit in the action table column.

4.Building Material Data Input Page Building Materials Data Input Page

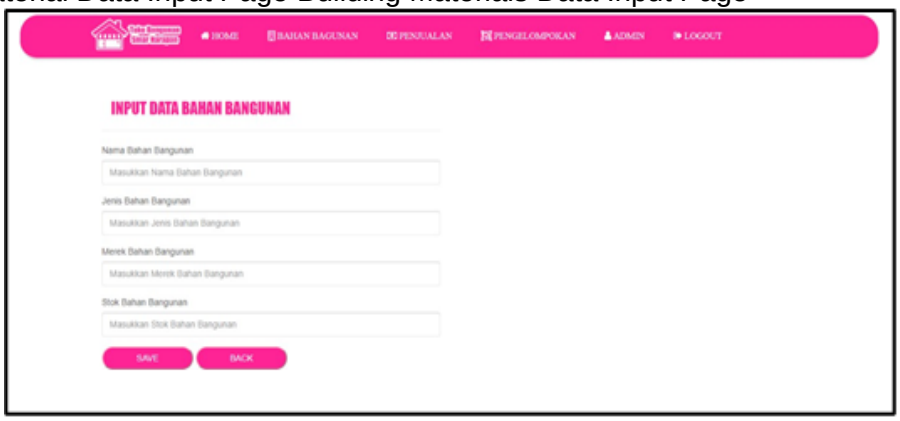

Figure 5 Building Material Data Input Page

Figure 5 is a page for adding building material data, the appearance on this page will be there are several text boxes and data input with a description of the name of the building materials building materials, types of building materials, building material brands, building material stocks and two buttons, namely the save and return buttons. also two buttons, namely the save and back buttons. This page is useful for inputting building material data, on this page the admin will enter building material data.building materials. After that the admin just clicks the save button and the system will save the data that has been inputted.save the data that has been inputted to the system database.

5.Building Material Sales PageBuilding Materials Sales Page

Figure 6 Building Material Sales Page

Figure 6 is a building material sales data table page which will later be processed k-means method, on this page will display a sales data table sales data table from the first to the fourth week as well as total sales and actions. action. There is a data input button to enter the sales data add page and a button to delete and edit in the and buttons to delete and edit in the action table column.

6.Sales Data Input Page Building Materials

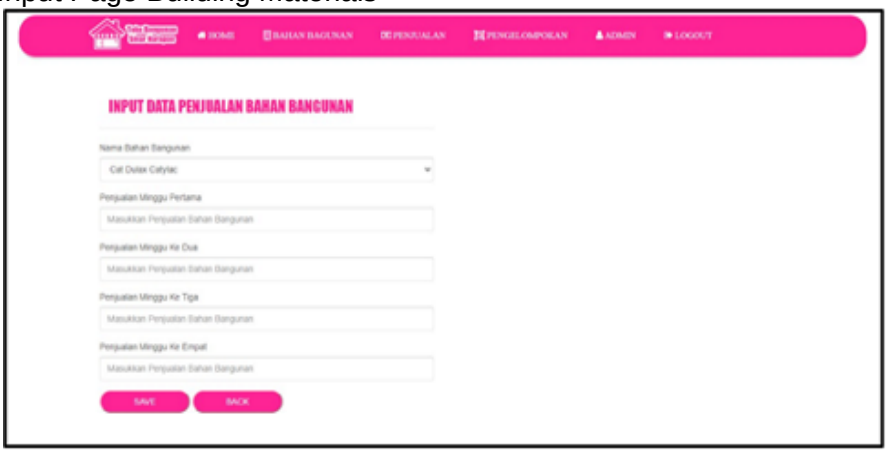

Figure 7 Building Material Sales Data Input Page

Figure 7 is a page for adding building material sales data on the display page. page will have several text boxes and data input with a description of the sales week and also two buttons, namely the save and return buttons. week of sales and also two buttons, namely the save and back buttons. Page This page is useful for inputting building material sales data, on this page the admin will enter building material sales data.This page admin will enter building material sales data. After that the admin just click the save button and the system will save the data that has been inputted into the system database.inputted to the system database.

7.Grouping Page

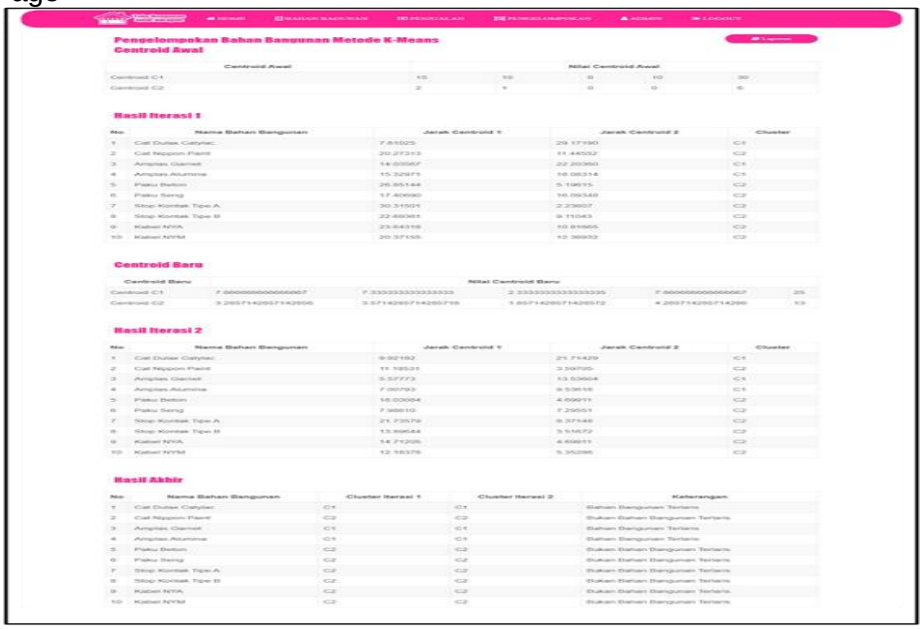

Figure 8 Grouping Page

Figure 8 is the k-means process page in grouping the best-selling building materials. best selling. On this page there are 5 tables namely the initial centroid table, table, the first iteration table, the new centroid table, the second iteration table and the results table. grouping of best-selling building materials. And there is a print button to print the results of grouping best-selling building materials.

8.Report Page

Figure 9 Report Page

Figure 9 is a report page of the calculation results of the K-Means method. In the report there is a letter cop along with the logo, then below there is a table of final results grouping of best-selling building materials and not the best-selling building materials.

9.Admin Page

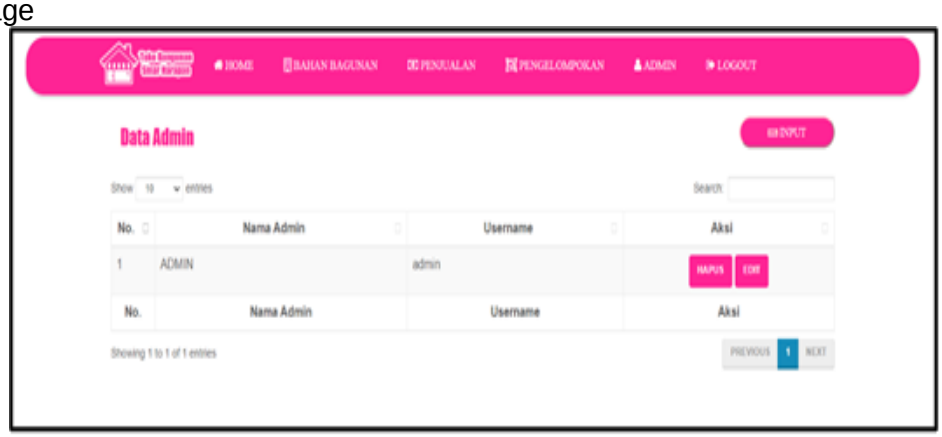

Figure 10 Admin Page

Figure 10 is the admin table page, on this page will display the admin data table where the table consists of data stored in the database.admin where the table consists of data stored in the database, namely no., admin name and username.namely no., admin name and username. At the beginning of the display will be empty when the data has not been filled in. There is an input button to enter the admin data add page.

CONCLUSION

Based on the results and discussion of research related to this study, various things can be concluded, among others, as follows:

1. The application of the k-means clustering method can be used to help determine in-selling building materials and not in-selling building materials.
2. The results of system testing of the program show that this program can be used to become an auxiliary medium for grouping the best-selling building materials at the Sinar Harapan Building Shop.

LIMITATION

After seeing the results achieved in this final project, there are several suggestions that need to be conveyed, among others:

1. The Sinar Harapan Building Shop is expected to be able to use this program continuously later to help group building materials so that it helps to stock building materials quickly.
2. To developers who want to develop this program can provide new content to be improvements to this program later.

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