

## IT Business Management to Determine Rendang Stock Inventory with the K-Means Algorithm

M. Defry Randy Pratama<sup>1</sup>

<sup>1</sup>Putra Indonesia University YPTK Padang

[Ran98p@gmail.com](mailto:Ran98p@gmail.com)

### Abstract

The stock management system at Uni Lili's Rendang Store is inadequate, so there are frequent shortages and excess stocks which have a negative impact on the business being run. To overcome this problem the author tries to provide a solution by designing a system that can make it easy to be able to manage stock using IT Business Management with the K-Means Algorithm method which aims to find out which products are in demand and which are not in demand based on enthusiasts. The data used in this analysis are 15 sample data with 2 clusters formed, namely less interested (Cluster 1) and many interested (Cluster 2). With the results of the analysis of the K-Means Algorithm, a website-based IT Business Management application was developed for the Rendang Uni Lili Store which is managed with the K-Means Algorithm. With this research, it can reduce risks in marketing and make it easier for consumers to purchase products

Keywords: Stock, Management, Cluster, Application, K-Means Algorithm

### Abstract

The stock management system at Uni Lili's Rendang Store is inadequate, so there are frequent shortages and excess stocks which have a negative impact on the business being run. To overcome this problem the author tries to provide a solution by designing a system that can make it easy to be able to manage stock using IT Business Management with the K-Means Algorithm method which aims to find out which products are in demand and which are not in demand based on enthusiasts. The data used in this analysis are 15 sample data with 2 clusters formed, namely less interested (Cluster 1) and many interested (Cluster 2). With the results of the analysis of the K-Means Algorithm, a website-based IT Business Management application was developed for the Rendang Uni Lili Store which is managed with the K-Means Algorithm. With this research, it can reduce risks in marketing and make it easier for consumers to purchase products.

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### 1. Introduction

In the midst of globalization and increasingly high levels of competition, MSMEs (Micro, Small and Medium Enterprises) are required to be able to face global challenges, such as increasing product innovation and developing human and technological resources so that they are able to compete and become a driving force for an increasingly developing economy.

Information technology has developed rapidly and is increasingly advanced, because it continues to experience updates with the aim of improving and perfecting existing technologies. Business actors can be more optimal in managing and improving marketing strategies by utilizing information technology.

Rendang Uni Lili is a business engaged in the field of food production, where Rendang Uni Lili produces rendang into various variants, packaged dishes and packaged practical spices to be served with other dishes

that have been registered with BPOM. Currently, stock control at Rendang Uni Lili is not yet effective, due to the absence of an adequate stock recording system. In the course of this business, the available product stocks are often not proportional to the number of buyers, resulting in inaccurate stock management.

The existence of Business Management Information Technology can reduce the error rate when data collection is followed by increased business output. Determining the amount of inaccurate product stock can be minimized by processing sales transaction historical data using data mining which aims to assist business people in providing product stock, namely using the K-Means algorithm .

Product clustering is one of the determinants of a company's product development in conducting sales activities. To overcome this so that there is no accumulation of products, research is carried out with the aim of making it easier for salesmen to bring the best-selling products so they can bring products that are

more consumptive. This research uses the K-Means Clustering Algorithm method which can help in grouping the best-selling and not-selling items. The results of this study are that the K-Means method can help find out the best-selling products on the market so that they can be used to develop a sales strategy [1].

In previous research related to K-Means, namely the Application of the K-Means Clustering Data Mining Method for Sales Analysis at Banten Hijab Fashion Stores, it helps in determining sales products that fall into the best-selling, best-selling and less-selling categories [2]. In addition, various existing methods can also be used in various aspects including making predictions or grouping various research objects. To make predictions, you can use the k-means method of data mining techniques to classify stock inventory [3].

Many items make it difficult for stores to process sales data, so clustering is needed so that you can find out which items are best selling and which are not selling best. In this study using the K-Means Clustering Algorithm method which can produce knowledge to be used in making decisions on sales and facilitate the analysis of doubling stock of goods [4].

Broadly speaking, a business information system is a collection of information that interacts with one another and is intended for business purposes, such as the process of selling products or services. To support information processing, information technology is needed and the role of computer technology is used as the main medium in conveying and processing information in the business being run [5]. Merging information systems with business is a surefire way to be able to promote products. The use of digital marketing in an industry is influenced by various factors that will affect the amount of marketing, both directly and indirectly [6].

The definition of business management is a science, art and process of activities carried out to achieve the common goals of a business effectively and efficiently starting from planning activities to controlling business activities carried out through the utilization of owned resources [5].

Micro, Small and Medium Enterprises, commonly known by the public as MSME, are types of productive economic enterprises owned or built by individuals or groups of entrepreneurs and managed by business entities or individuals who have met the business criteria. Micro, Small and Medium Enterprises aim to grow and develop their businesses. Every MSME actor must never be separated from the promotional activities of the products they have. With the advancement of information technology, MSMEs can take advantage of technological advances in providing information and promotions about their products online, namely through website media. So that MSME actors can easily promote and provide information about the products being sold so that their business continues to run and is

also more effective and efficient in terms of time and cost [7].

Data Mining is data that describes the past in order to predict the future by analyzing the data. Data mining is a scientific discipline that combines statistics, machine learning, artificial intelligence as well as database technology. Data mining is observing a large data set to find unexpected relationships and to summarize data in new ways that can be useful for data owners [8].

K-Means is a non-hierarchical data clustering method that seeks to partition existing data in the form of one or more clusters so that data with the same characteristics will be grouped into the same cluster, and data with different characteristics will be grouped into different groups. others[9].

Software engineering is a scientific discipline that addresses all development processes by utilizing engineering principles or concepts from the initial stage to development with the aim of producing software that has economic value, is trusted and works efficiently using machines [10].

Software (software) is a computer program associated with software documentation such as documentation of requirements, design models, and how to use (user manual). If a computer program is not associated with documentation, it cannot be called software [11].

Unified Modeling Language (UML) is a standard language that is widely used in the industrial world to define requirements, make analysis and design, and describe architecture in object-oriented programming [12].

Website or site can be interpreted as a collection of pages that display text data information, still or moving image data, sound animation data, video and or a combination of all of them. Both static and dynamic which form a series of interrelated buildings where each is connected to a network of pages [13].

The PHP programming language is a programming language for creating websites that are server-side scripting. PHP is dynamic. PHP can be run on various operating systems such as Windows, Linux, and Mac Os. Besides Apache, PHP also supports several other web servers, such as Microsoft ISS, Caudium, and PWS [14].

MySQL is a database server developed in an open source environment and distributed free of charge under the GPL license. MySQL is the most popular open source programming and is widely used in the Linux environment [14]

## **2. Research methodology**

To assist in the preparation of this research so that the steps in solving the problems to be discussed can be clearly structured, it is necessary to have a framework

arrangement. The research framework contained in Figure.1.

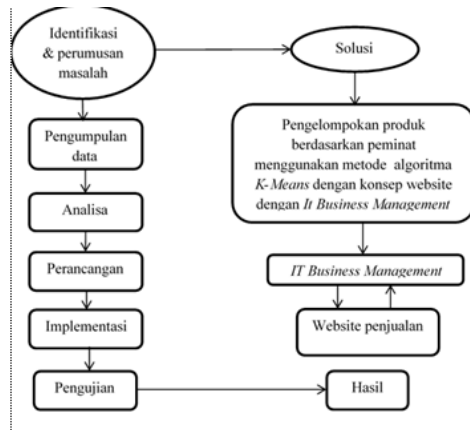


Figure 1. Research Framework

The research stage is a sequence of processes or steps that will be carried out in completing this research. The stages of this research are as follows:

2.1 Field Research

This research was conducted by interviewing Mrs. Ermaneli who is the owner of the Rendang Uni Lili shop and asking questions and analyzing problems and obtaining the necessary data

2.2. Library Research

This library research is done by reading journals, books, internet, articles related to the method to be used. So that the data obtained can be used as a basis for further research stages

2.3. Analysis

Based on the problem identification above, the researcher conducted data analysis first. This is so problem solving can produce new solutions.

2.4. System planning

In this study the authors apply the concept of IT Business Management based on website sales using the K-Means Algorithm method using the PHP programming language and MySQL database.

2.5. System Implementation

The testing method used in this study is the direct testing method, namely by using interface testing. Used to test the special functions of the designed software.

2.6. System Testing

System testing is a stage that is carried out when the repetition process has been completed and the system is ready to be used to find out whether the designed system is running correctly and is free from errors.

2.7 Results

Presents the output display from the results of the variable analysis that has been processed before

3. Results and Discussion

This study uses data consisting of stock and transactions at the Rendang Uni Lili shop business

Table 1. Sales Data Table

Product name	Stock	Sold
Beef Rendang 250gr	200	122
Beef Rendang 500gr	100	22
Shredded Chicken 150gr	35	16
Shredded Chicken 250gr	90	25
Shredded Chicken 500gr	15	1
Beef Lung Rendang 250gr	60	10
Beef Lung Rendang 500gr	50	1
Rendang Jengkol 250gr	50	8
Rendang Jengkol 500gr	30	1
Tuna Fish Rendang 250gr	25	2
Lokan Rendang 250gr	40	17
Lokan Rendang 500gr	20	2
Chicken Rendang 250gr	35	7
Chicken Rendang 500gr	30	2
Egg Rendang	120	52

The clusters that will be formed include:

- a. Cluster 1 (C1) = Less interested
- b. Cluster 2 (C2) = Lots of Enthusiasts

In this study, the initial centers of clusters or centroids were selected, namely, C1(25 , 2) and C2(120 , 52), then the distance calculation of the remaining sample data from the cluster center can be carried out using the formula:

$$D_{11} = \sqrt{(M_{1x} - C_{1x})^2 + (M_{1y} - C_{1y})^2}$$

Where :

M : Data coordinates

C : Centroid coordinates

D : Distance

$$D_{11} = \sqrt{(200 - 25)^2 + (122 - 2)^2} = 212.1909517$$

$$D_{12} = \sqrt{(100 - 25)^2 + (22 - 2)^2} = 77.62087348$$

$$D_{13} = \sqrt{(35 - 25)^2 + (16 - 2)^2} = 17.20465053$$

$$D_{14} = \sqrt{(90 - 25)^2 + (25 - 2)^2} = 68.9492567$$

$$D_{15} = \sqrt{(15 - 25)^2 + (1 - 2)^2} = 10.04987562$$

$$D_{16} = \sqrt{(60 - 25)^2 + (10 - 2)^2} = 35.90264614$$

$$D_{17} = \sqrt{(50 - 25)^2 + (1 - 2)^2} = 25.01999201$$

$$D_{18} = \sqrt{(50 - 25)^2 + (8 - 2)^2} = 25.70992026$$

$$D_{19} = \sqrt{(30 - 25)^2 + (1 - 2)^2} = 5.099019514$$

$$D_{110} = \sqrt{(25 - 25)^2 + (2 - 2)^2} = 0$$

$$D_{111} = \sqrt{(40 - 25)^2 + (17 - 2)^2} = 21.21320344$$

$$D_{112} = \sqrt{(20 - 25)^2 + (2 - 2)^2} = 5$$

$$D_{113} = \sqrt{(35 - 25)^2 + (7 - 2)^2} = 11.18033989$$

$$D_{114} = \sqrt{(30 - 25)^2 + (2 - 2)^2} = 5$$

$$D_{115} = \sqrt{(120 - 25)^2 + (52 - 2)^2} = 107.3545528$$

Do the same for calculating each point to the 2nd center

$$D_{21} = \sqrt{(200 - 120)^2 + (122 - 52)^2} = 106.3014581$$

$$D_{22} = \sqrt{(100 - 120)^2 + (22 - 52)^2} = 36.05551275$$

$$D_{23} = \sqrt{(35 - 120)^2 + (16 - 52)^2} = 92.30926281$$

$$D_{24} = \sqrt{(90 - 120)^2 + (25 - 52)^2} = 40.36087214$$

$$D_{25} = \sqrt{(15 - 120)^2 + (1 - 52)^2} = 116.7304588$$

$$D_{26} = \sqrt{(60 - 120)^2 + (10 - 52)^2} = 73.23933369$$

$$D_{27} = \sqrt{(50 - 120)^2 + (1 - 52)^2} = 86.60831369$$

$$D_{28} = \sqrt{(50 - 120)^2 + (8 - 52)^2} = 82.68010643$$

$$D_{29} = \sqrt{(30 - 120)^2 + (1 - 52)^2} = 103.4456379$$

$$D_{210} = \sqrt{(25 - 120)^2 + (2 - 52)^2} = 107.3545528$$

$$D_{211} = \sqrt{(40 - 120)^2 + (17 - 52)^2} = 87.32124598$$

$$D_{212} = \sqrt{(20 - 120)^2 + (2 - 52)^2} = 111.8033989$$

$$D_{213} = \sqrt{(35 - 120)^2 + (7 - 52)^2} = 96.17692031$$

$$D_{214} = \sqrt{(30 - 120)^2 + (2 - 52)^2} = 102.9563014$$

$$D_{215} = \sqrt{(120 - 120)^2 + (52 - 52)^2} = 96.17692031$$

Based on the results of the cluster search above, it can be concluded that the comparison of cluster results by grouping small and large results is as follows:

Table 2. Comparison table for iteration-1 cluster results

Member C1	C2 member
	M1
	M2
M3	
	M4
M5	
M6	
M7	
M8	
M9	
M10	
M11	
M12	
M13	
M14	
	M15

Based on the results of iteration 1, members from C1 (M3, M2, M5, M7, M8, M9, M10, M12, M13, M14) were obtained, and members from C2 (M1, M2, M4, M15). After the process, a new centroid center position will be obtained, namely C1 (35.45454545, 6.090909091), C2 (127.5,55.25).

After searching for iteration-2 using the same process as iteration-1, the following results will be obtained:

Table 3. Comparison table of iteration-2 cluster results

Member C1	C2 member
	M1
	M2
M3	
	M4
M5	
M6	
M7	
M8	
M9	
M10	
M11	
M12	
M13	
M14	
	M15

The search is stopped because the cluster positions from this iteration and the previous iteration have not changed. In the calculations that have been done above, it can be concluded that of the 15 transaction data provided there are two groups with the provisions that C1 (less interested) produces 11 products and C2 (many interested) produces 4 products. And it can be stated that C2 (a lot of enthusiasts) is a cluster of products that are selling well based on stock and transactions from the samples obtained

Table 4. Table of cluster results

Product name	Results
Beef Rendang 250gr	C2
Beef Rendang 500gr	C2
Shredded Chicken 150gr	C1
Shredded Chicken 250gr	C2
Shredded Chicken 500gr	C1
Beef Lung Rendang 250gr	C1
Beef Lung Rendang 500gr	C1
Rendang Jengkol 250gr	C1
Rendang Jengkol 500gr	C1
Tuna Fish Rendang 250gr	C1
Lokan Rendang 250gr	C1
Lokan Rendang 500gr	C1
Chicken Rendang 250gr	C1
Chicken Rendang 500gr	C1
Egg Rendang	C2

System interface testing

This page is the first page that is seen by visitors, customers when accessing the website. On this page you can see all the products sold including product recommendations and if you want to make a transaction, visitors must register or log in first, along with the display page can be seen in the image below:

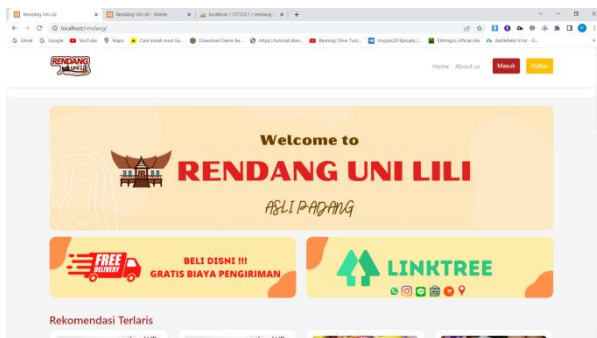


Figure 2 Views of the main visitor page

This page will appear if we click the login button. Here we need to input the previously registered email and password to be able to enter and access the customer menu. The following view of the login page can be seen in the image below:

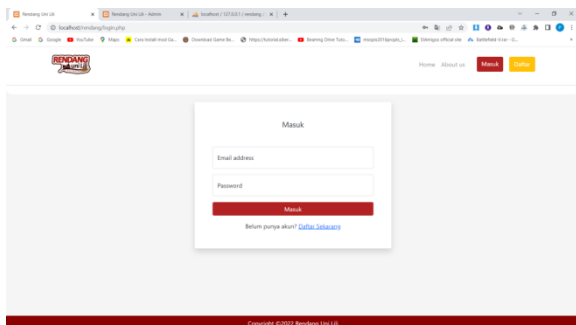


Figure 3 View of the Visitor Login Page

If you click the buy button after determining the number of items you want to buy on the customer's

main page, the product we choose will enter the basket, the following is the display of the shopping cart page, which can be seen in the image below:

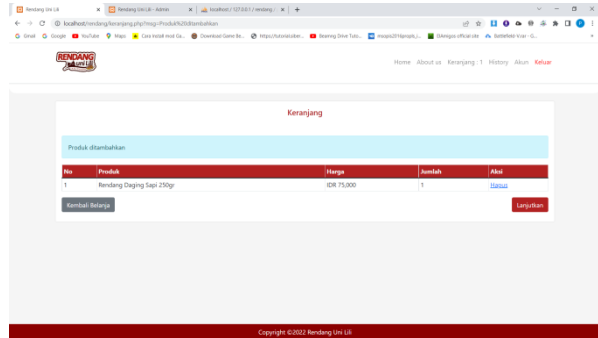


Figure 4 Display of the Customer Basket Page

If the customer continues the transaction, it will go to the checkout page, on this page the customer is required to complete data from and select the type of delivery available and also contains product details and the total product price, along with the checkout page display can be seen in the image below:

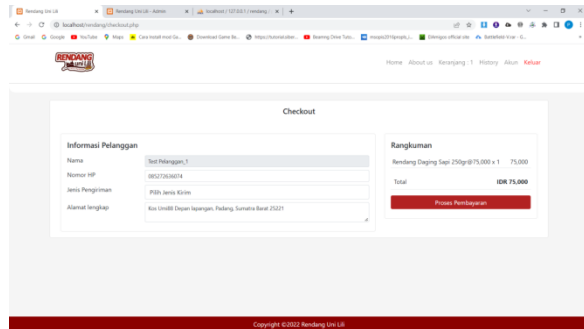


Figure 5 Display of the customer Checkout Page

After filling in the data and clicking the payment process button, the customer will be directed to the payment page. Here the customer can see the full details of the order. Customers will also receive payment account number information and are also asked to upload proof of payment. Here's how the payment page looks:

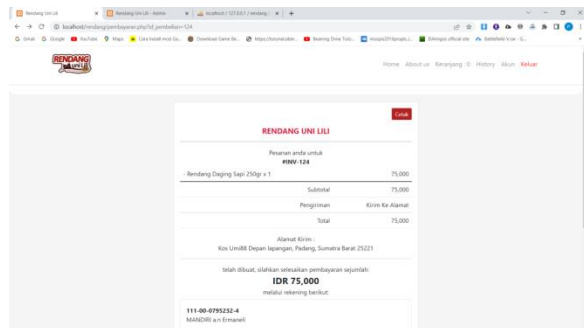


Figure 6 Display of the payment page

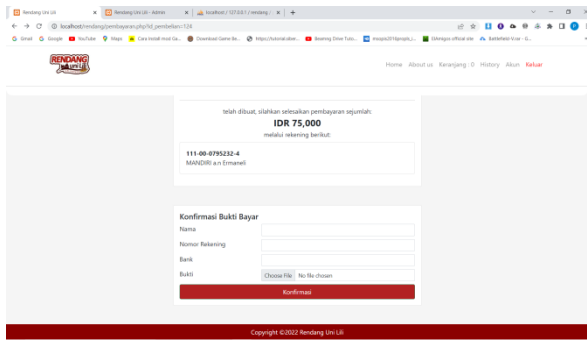


Figure 7 Display of the Payment Page

On this page customers can view their order history including purchase status and type of delivery. The following view of the History page can be seen in the image below:

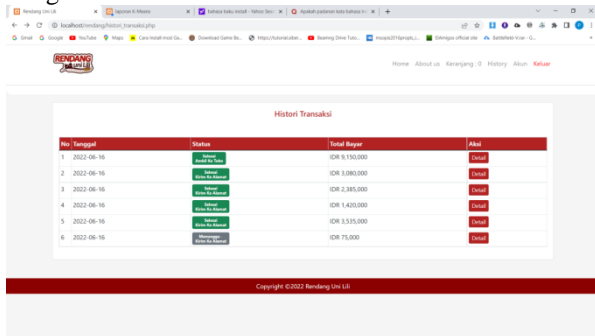


Figure 8 Display of the Customer History Page

Customers can print a purchase receipt by clicking the print button on the purchase details in the history menu. The following display of the printed page can be seen in the image below:

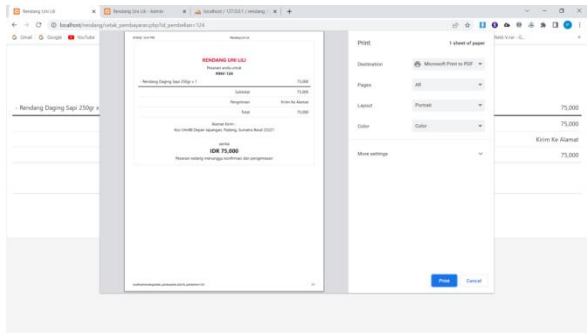


Figure 9 Display of the Order Receipt Page

On this page there is product data, the number of product stocks and the number sold, there are actions to manage product stocks. For more details, it can be seen from the following image:

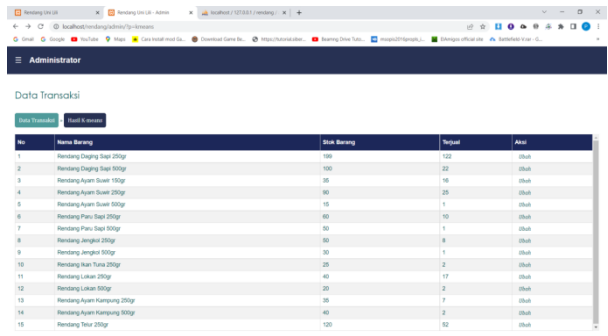


Figure 10 Display of the K-Means Admin Transaction Data Page

On this page there is an input form for the cluster center point value and 4 tables, namely, the center point table which displays product data that is used as the center point value, the processing results table displays all products with grouping results that are selling well and are not selling well, the selling table displays products with grouping results selling, and the less selling table displays all products that fall into the less selling category. For more details, it can be seen from the following image:

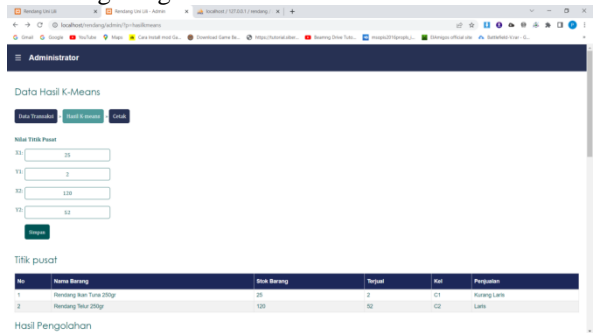


Figure 11 Display of the K-Means Admin Results Page

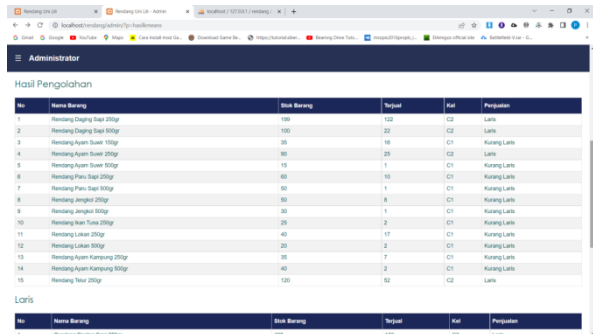


Figure 12 Display of the K-Means Admin Results Page

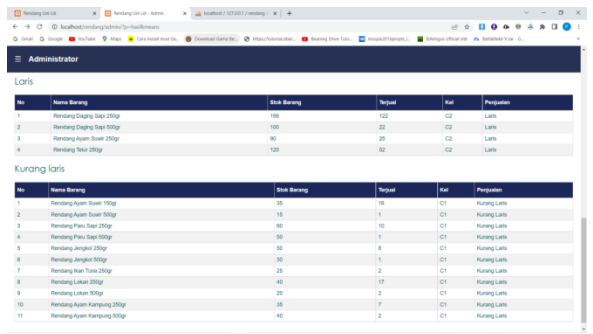


Figure 13 Display of the K-Means Admin Results Page

On the K-Means page there is a print button which functions to print or save the results of the K-Means process. For more details, see the printed page view of the following figure:

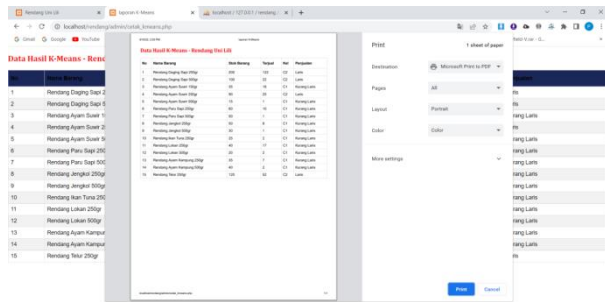


Figure 14 Display of the K-Means Admin Process Results Print Page

#### 4. Conclusion

From the research results and then proceed to the analysis and design of the data processing system that has been carried out, it can be concluded that IT Business Management using the Website-based K-Means algorithm, the Rendang Uni Lili store has been able to determine stock inventory at Rendang Uni Lili. This is proven by being able to reduce the occurrence of risks in marketing, and make it easier for consumers to purchase products, and has been able to apply web-based.

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