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Design Of Sales Application With Data Mining Using Analysis Basket Market Methodand Apriori Algorithm In The Jetlag Coffee

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A B S T R A C T

The tight competition in sales, made the owner of Jetlag Coffe must be smart in analyzing the market. In addition, the availability of goods sold is one of the factors that must be analyzed so that customer needs can be met. To support this, previous sales data can be used to analyze the market and customer needs with market basket analysis. Addition of a priori algorithms including the types of association rules in data mining, a priori algorithms that aim to find items sets run on a set of data. Based on this relationship, it is possible to promote goods with a pattern of attachment to the item. Consumers who purchase products will be interested in purchasing different products, than those usually purchased by other consumers before. By offering products contained in the pattern of sales of these products. By using this market basket analysis and a priori algorithm method, it is hoped that it can also optimize the database, increase sales, and minimize product promotions that have low sales levels. By minimizing the promotion of goods that are not bought, consumers will not be disturbed by the promotion of products that do not have a pattern of attachments, so that promotions will be more effective.

1. Introduction

The development of information technology has contributed to the rapid growth in the amount of data collected and stored in large databases (piles of data). It takes a method or technique that can change the pile of data into valuable information or knowledge that is useful to support business decision making. A technology that can be used to make it happen is data mining. Data mining is the process of finding interesting patterns or information in selected data using certain techniques or methods. One method that is often used in data mining is the shopping basket analysis method. Market basket analysis is a method of analyzing consumer behavior specifically from a certain group / group. Sources of data from market basket analysis can be sourced from consumer transactions in the previous period. Market basket analysis is generally used as a starting point for the search for knowledge (knowledge) of a data transaction when we do not know the specific pattern of what we are looking for. Market basket analysis needs start from the accuracy and the benefits it produces in the form of associations (association rules). What is meant by association (association rules) are patterns of interrelation of data in a database.

Jetlag Coffee is a cafe that was established in 2016. The cafe is located in Domestic Terminal 3, Soekarno Hatta Airport, Tangerang, Banten. Until now Jetlag Coffee sells a variety of coffee drinks and snacks. Every transaction data is recorded in a database system through the cashier application. In 2019, sales of Rp 1,086,585,300 were obtained, while in 2018 sales from Jetlag Coffee were around Rp 1,360,755,000. It can be seen that in 2018 to 2019 it decreased by 20% from the previous year.

Based on the problems faced by Jetlag Coffee, a solution is needed, namely a sales system using data mining market basket analysis and a priori methods. Jetlag Coffee's sales transaction data in 2018 will be analyzed using the basketball market analysis and a priori data mining method to see the association relationship (correlation) between a number of sales attributes. The algorithm that will be used is the Apriori algorithm. This algorithm is used to form frequent itemsets which will later be used as a reference for formulating association rules produced by the basketball analysis market model using the Sales Enhancement Application tool.With this research, it is expected to provide

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results in the form of useful information for related parties in increasing sales transactions at Jetlag Coffee. Specifically for the marketing strategy at Jetlag Coffee.

2. Theory

2.1 Design

Designing a thing is the most important thing in making something, whether in making a system or making a work in any form. Because the design will be the main foundation in carrying out the steps of making a work. Design or design is a series of procedures to translate the results of analysis and a system into a programming language to describe in detail how the system components are implemented. While the understanding of building systems is the activity of creating new systems or replacing or improving existing systems both in whole or in part (Pressman, 2002).

2.2. Definition of Sales

The term sales is often confused with the term marketing, even ironically there are those who assume the same understanding of sales and marketing. Misunderstanding is not only in sales practices but also in the company's organizational structure. In essence the two terms have different meanings and scope. Marketing has a broader meaning covering various functions of the company, while sales are part of the marketing activities themselves. Thus sales are not the same as marketing. Sales are activities related to the production process, finance, human resources, research and development and so on so that it is impossible that successful sales are not synergized with other aspects of the company. Sales is the goal of marketing, which means the company through its marketing department / department, including the sales force, will try to carry out sales activities to finish the product.

2.3. Data Mining

Data mining is a process that uses statistical techniques, mathematics, artificial intelligence, and machine learning to extract and identify useful information and related knowledge from various large databases. In data mining there are two approaches to training methods, namely:

a) Unsupervised learning, this method is applied without training and without a teacher. The teacher here is the label of the data.
b) Supervised learning, namely the method of learning in the presence of exercises and trainers. In this approach, to find the decision function, separator function or regression function, several sample data that have output or labels are used during the training process.

There are several techniques that data mining has based on the tasks that can be done, each technique has its own algorithm. Techniques in data mining are divided into six categories, namely:

a) Description
Researchers usually try to find ways to describe hidden patterns and trends in the data.
b) Estimation
Estimates are similar to classifications, except that the destination variable is more numerical than the category.
c) Predictions
Prediction has similarities with estimation and classification. It's just that the prediction of the results shows something that hasn't happened (it might happen in the future).
d) Classification
In the classification of variables, objectives are categorical. For example, we will classify income in three classes, namely high income, medium income, and low income.
e) Klastering
Clustering is more towards grouping records, observations, or cases in classes that have similarities.
f) Association
Identify relationships between various events that occur at one time.

2.4. Market Basket Analysis

Market Basket Analysis or commonly known as Association Rule Mining is a data mining technique that comes from the field of marketing (Aguinis, et al., 2013). This technique is used to determine which products will be purchased by consumers simultaneously by analyzing the list of consumer transactions (Ngatimin, 2013). In the process, Market Basket Analysis will analyze buying habits from consumers by finding associations between different products placed by consumers in shopping baskets (shopping basket).

The association method is known as one of the data mining methods which is the basis of various other data mining methods. One stage of association analysis called frequent pattern mining (analysis of high frequency patterns) attracts the attention of many researchers to produce efficient algorithms. The importance of an associative rule can be determined by two parameters, support (support value), which is the percentage of the item combination. in the database and confidence (the value of certainty), namely the strong relationship between items in the associative rules. Association analysis defined a process to find all associative rules that met the minimum requirements for support (minimum support) and the minimum requirements for confidence (minimum confidence) (Pramudiono, 2007).

2.5. Apriori Algorithm

A priori algorithm is a method for finding patterns of relationships between one or more items in a dataset. Apriori algorithm including the type of association rules in data mining. Apart from a priori, those included in this

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Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

group are the method of generalized rule induction and hash based algorithm. Rules that state the association between several attributes are often called affinity analysis or market basket analysis.
The basic methodology of association analysis is divided into two stages:

a) Analysis of high frequency patterns
   This stage looks for combinations of items that meet the minimum requirements of support values in the database.
b) Establishment of associative rules
   After all high frequency patterns have been found, then the associative rules are sought that meet the minimum requirements for confidence by calculating the confidence of associative rules A => B.

The basic idea of the Apriori algorithm is to find a combination of items that meet the minimum requirements of the support value in the database. An item's support value is obtained using the following formula:

$$Support\ (A) = \frac{Number\ of\ transactions\ containing\ A}{Total\ transaction}$$

The support value of 2 items is obtained using the formula:

$$Support\ (A,B) = P(A \cap B)$$

$$Support\ (A,B) = \frac{\sum Transaction\ Containing\ A\ and\ B}{\sum Transaction}$$

The confidence value is obtained using the formula:

$$Confidence = P(B|A) = \frac{Number\ of\ transactions\ containing\ A\ and\ B}{Number\ of\ transactions\ containing\ A}$$

3. Research Method

The method applied in this study can be described as follows:

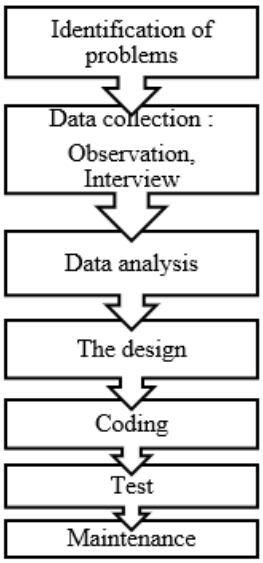

Fig 1. Research Method

The following describes the methods used in the study as follows:

a) Identification of Problems
   Determine the background of the problem to be studied and also determine the scope of the problem.
b) Data Collection
   Data collection is carried out to obtain the information needed in order to achieve research objectives. This data collection consists of observations and interviews.
   1) At this observation stage the researcher gets the data, information and studies the notes and documents that are there

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Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
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2) Researchers conducted interviews with Jetlag Coffee employees to obtain information about sales transactions.

c) Analysis
At this stage the researcher analyzes the existing problem.

d) Design
At the design stage is the stage where researchers design the initial appearance or interface of the application to be built. Interface display will be designed through data that has been obtained during the analysis phase.

e) Coding
At the coding stage which is translating the application into a predetermined programming language that is the PHP programming language.

f) Test
It is a testing phase of an application that has been made into a system that is ready to use with the aim of knowing whether the system is made as expected.

g) Maintenance
At the maintenance stage is the stage where making corrections of various errors that were not found in the previous stages so that improvements are made, in order to produce a better system than before.

4. Result And Implementation

4.1. Current Systems Analysis

The information system currently running at JetLag Coffee can provide fairly accurate results, but from observations it turns out there are still some shortcomings that make data processing quite difficult to do. Some of these problems can be described as follows:

1) In processing transaction data and product inventories, they have not used a computerized system, but still use a manual system in the sense that they still use thick books in processing and storing their data.
2) Important records in the form of paper can be lost and easily damaged.
3) There is still a lack of information generated from data processing in the current system.
4) Often there is a delay in the preparation of the report due to having to collect irregular documents in advance and the absence of a system that can accumulate data automatically.

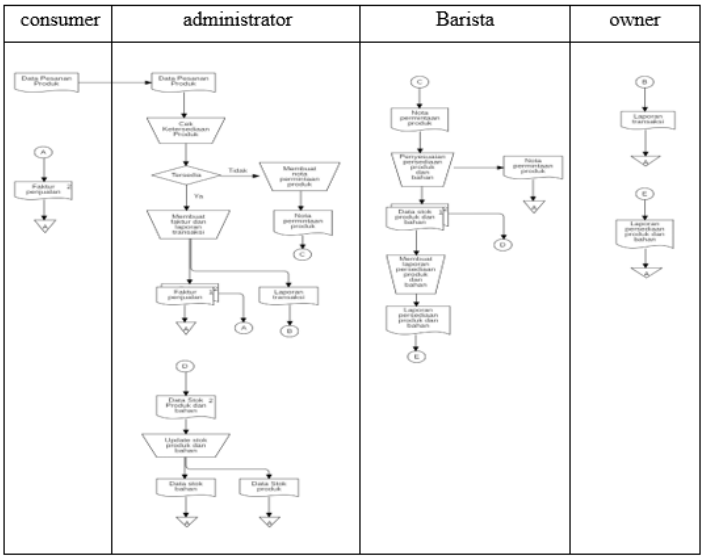

Fig 2. Flowmap System running

4.2. Use Case Diagrams

Use Case Diagram is a picture of system user interaction with the system by carrying out functions that are acceptable to the system. In this system, there is one user actor, the admin who performs different functions to the system. The form of user interaction with the system can be seen in the Figure below.

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Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

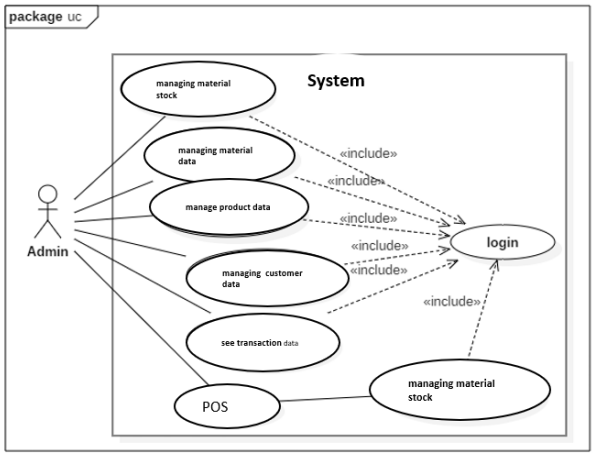

Fig 3. Use Case Diagrams

4.3. Interface Design

The design of the interface of the proposed system is the basis for making the proposal system. Following this design each proposed system functional page is as follows.

This page functions to display the login page for the admin. On this page the admin must fill in the username and password fields. The following is the form of the login page design.

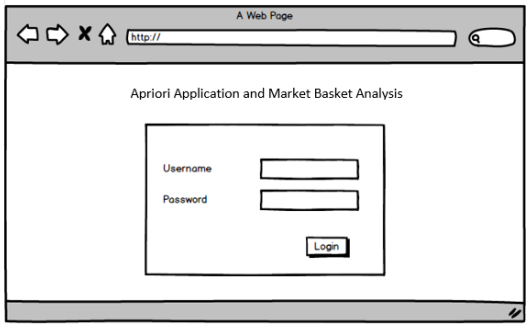

Fig 4. Login page

4.4. Market Basket Analysis

Based on product sales transactions at Jetlag Coffe, these transactions can be accumulated. Accumulated product sales transactions obtained from weekly sales taken from the top 3 weekly reports, can be seen in the table below:

Table 4.1 Product Sales Transaction Patterns

No	Itemset
1	Espresso, Cappuccino, Latte
2	Mochaccino, Cappuccino, Latte
3	Latte, Roti Bakar, Mochaccino
4	Espresso, Cappuccino, Latte
5	Cappuccino, Roti Bakar, Latte
6	Latte, Cappuccino, Mochaccino
7	Latte, Roti Bakar, Mochaccino
8	Cappuccino, Roti Bakar, Latte
9	Espresso, Cappuccino, Latte
10	Mochaccino, Cappuccino, Latte

4.5. System Implementation

System implementation phase is the process of building a system in accordance with the design and system design that has been made previously.

a. Database Implementation

At this stage the implementation of database design has been carried out in the previous stage. The following is the database implementation display:

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Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

1) User Table

This user table serves to hold user data. In the admin table there are attributes, namely user_id, username, password, user_name, user_type_lender, user_foto, user_status. Where user_id is the primary key.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	user_id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	username	varchar(50)	latin1_swedish_ci		Yes	NULL			Change Drop More
3	password	varchar(50)	latin1_swedish_ci		Yes	NULL			Change Drop More
4	user_name	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
5	user_jenis_kelamin	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
6	user_foto	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
7	user_status	tinyint(1)			Yes	NULL	1 = gudang, 2,= kasir, 9 = admin		Change Drop More

Fig 5. User Table

2) Transaski table

This transaction table serves to hold transaction data. In the transaction table there are attributes, namely transaction_id, transaction_no, transaction_tgl, user_id. Where transaction_id is the primary key.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	transaksi_id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	transaksi_no	varchar(50)	latin1_swedish_ci		No	None			Change Drop More
3	transaksi_tgl	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
4	user_id	int(11)			Yes	NULL			Change Drop More

Fig 6. Transaction Table

3) Product Table

This product table serves to collect product data sold at Jetlag Coffee. In this product table there are attributes namely id_comment, comment, like, id_ goods, name, date. Where id_comment is the primary key.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	produk_id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	produk_name	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
3	produk_gambar	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
4	produk_code	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
5	produk_harga	int(11)			Yes	NULL			Change Drop More

Fig 7. Product Table

4) Product Material Table

This product material table serves to hold material data of each product. In the product material table there are attributes, namely product_product_id, material_id, product_id, usage_count. Where is the product_id_id as the primary key.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	bahan_produk_id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	bahan_id	int(11)			Yes	NULL			Change Drop More
3	produk_id	int(11)			Yes	NULL			Change Drop More
4	jumlah_pemakaian	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More

Fig 8. Table of Product Ingredients

5) Material Table

This material table serves to hold data - all material data from all products. In the material table there are attributes that are materi_id, materi_name, materi_satuan. Where is ingredient_id as the primary key.

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	bahan_id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	bahan_name	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
3	bahan_satuan	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More

Fig 9. Material Table

6) Material Stock Table

This material stock table serves to hold data - inventory data of all materials. In the material stock table there are attributes namely id_user, username, password, status. Where id_user is the primary key.

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Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

#	Name	Type	Collation	Attributes	Null	Default	Comments	Extra	Action
1	stok_bahan_id	int(11)			No	None		AUTO_INCREMENT	Change Drop More
2	stok_bahan	varchar(255)	latin1_swedish_ci		Yes	NULL			Change Drop More
3	bahan_id	int(11)			Yes	NULL			Change Drop More

Fig 10. Material stock table

b. Interface Implementation

1) Login page

The login page functions for system security. On this page the user must fill in the username and password fields. The following is the proposed system login page.

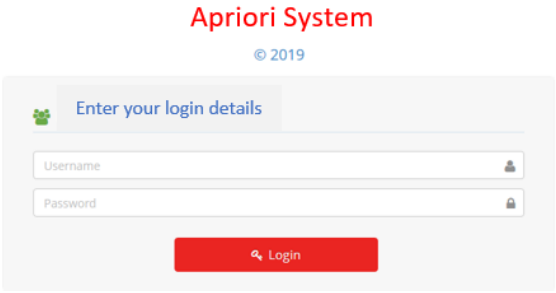

Fig 11. User login page

2) Material List Page

Material list menu page functions to manage material data. The following is the result of the implementation of the ingredients list page.

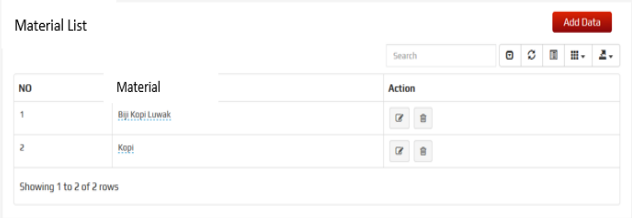

Fig 12. Material list page

3) Material Stock Page

Material list menu page functions to manage material stock data. The following is the form of the results of the material stock page implementation.

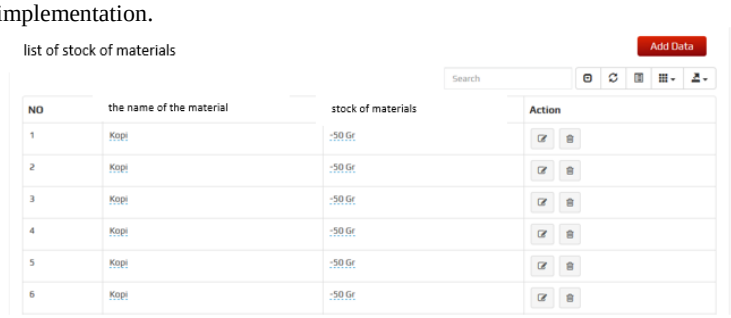

Fig 13. Material stock pages

4) Product Page

Product list menu page functions to manage product data. The following is the form of the results of the product page implementation.

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Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
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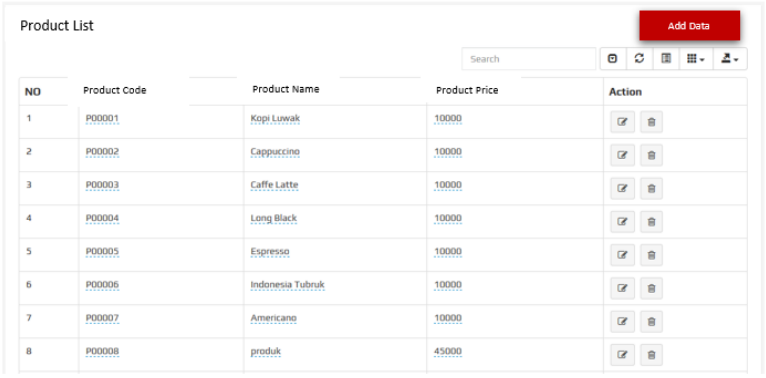

Fig 14. Product pages

5) User Page

User list menu page functions to manage user data. The following is the form of the results of user page implementation.

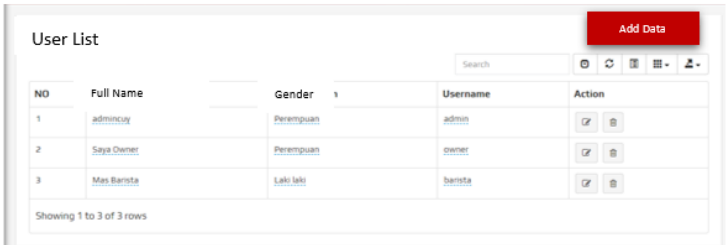

Fig 15. User page

6) Transaction page

Transaction menu page functions to view existing transaction data. The following is the form of the results of the transaction page implementation.

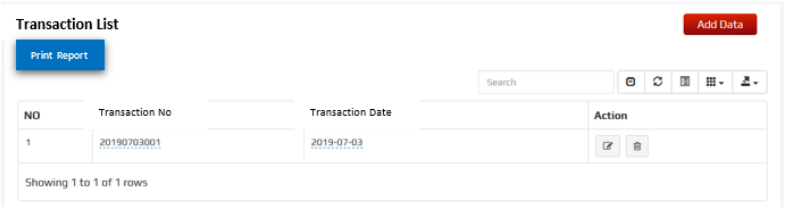

Fig 16. Transaction page

On the "Add Data" button the system will open the POS menu that is used to add a new transaction list. The print report button also functions to print exported transaction reports in Excel format. While the "view details" button functions to display the transaction details page.

7) POS page

The post menu page serves to add new transaction data, where there is a list of items or products offered, there are also recommended products that are above the item list. The following is the form of post page implementation results.

Accredited "Rank 4"(Sinta 4), DIKTI, No. 36/E/KPT/2019, December 13th 2019.

Jurnal Mantik
Volume 4 Number 1 May 2020, pp. 139-148 E-ISSN 2685-4236
https://iocscience.org/ejournal/index.php/mantik/index

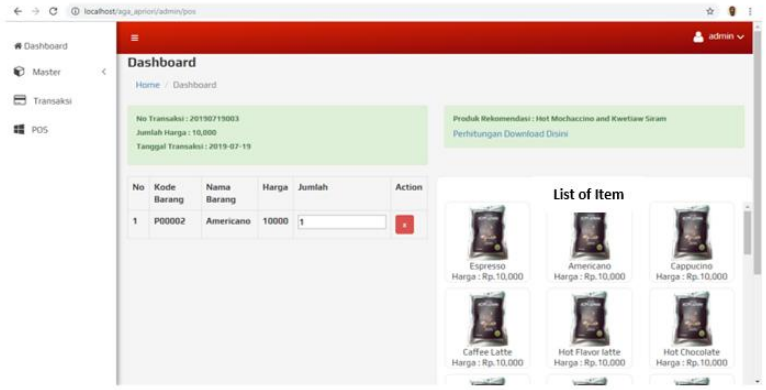

Fig 17. Post page

4.6. Test result

Based on the testing that has been done, the following results from the testing process have been carried out:

Table 4.2 Admin Trial Results

No.	Component	Discription	Result
1.	Login	Menu that works to open the admin dashboard page	Success
2.	Manage Material Data	To view material data, edit, delete and add material data.	Success
3.	Manage Material Stock Data	To view material stock data, edit, delete and add material stock data.	Success
4.	Manage Product Data	To view product data, edit, delete and add product data.	Success
5.	Manage User Data	To view user data, edit, delete and add user data.	Success
6.	Transaction Data	To view transaction data and transaction details, and print transaction reports.	Success
7.	POS	To add transaction data and can recommend products to consumers.	Success

5. Conclusion

Based on the results of the implementation and trials that have been carried out, it can be concluded that the results of this study are as follows:

a. The system has succeeded in increasing productivity at Jetlag Coffee by using the market basket analysis method and a priori algorithm.
b. The system successfully records sales transactions in Jetlag Coffe and optimizes them with market basket analysis and a priori algorithms to provide product recommendations.

Based on the results of the application implementation, found suggestions for application development that can be done in further research are as follows:

a. The system can be developed into a mobile application, so consumers can order products on their smartphone devices.
b. For further research, it can apply different frequent itemset generation algorithms, such as FP-Growth.

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