

Implementation of the Rapid Application Development (RAD) Method in the Development of Sales Applications at Coffee Shops Using the Apriori Algorithm (Case study: SIMERA Coffee Shop)

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ABSTRACT

Simera Coffee is a small and medium-sized business that focuses on selling typical Indonesian coffee products in the form of coffee powder, where each type of coffee is obtained from specific and trusted suppliers to maintain coffee quality and consumer confidence. The problem is that business people must be able to set patterns in knowing item items, maximize data utilization, and store expenditure data without being analyzed in detail; moreover, difficulties in restocking, so product expenditure data do not know the pattern of the data. Sales transaction data is continuously increasing every day, causing the need for ample data storage. The apriori algorithm can be applied to a sales data management application or cashier application, which has the function of recording coffee powder sales transactions and, at the same time, providing the function of analyzing sales data contained in the database using the a priori algorithm.

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1. INTRODUCTION

Coffee is a commodity that is cultivated by many parties in accordance with the level of needs both in terms of quantity and type, so that there are two types of coffee that are most widely known, namely Arabica coffee and Robusta coffee [1]. From Indonesia there are also various types of well-known coffee such as Luwak coffee, Java coffee, Toraja coffee, Gayo coffee, Kintamani coffee and many other types [2]. This type of coffee has a unique taste that can compete in the global market [3]. Simera Coffee is a small and medium-sized business that focuses on selling typical Indonesian coffee products in the form of coffee powder, where each type of coffee is obtained from specific and trusted suppliers to maintain coffee quality and consumer confidence. Simera Coffee was founded in 2014 with a store address at Jalan Karna Sosial Gg. Wonoyoso 2 Pontianak. Since the year it was founded until now, the sales of these coffee products are still up and down every month which can be caused by the buyer, type of coffee, quantity, price and others so that the calculation of capital or cost is not under profits.

The problem that often occurs is that business people have not been able to set patterns in knowing item items, maximize data utilization, and expenditure data is only stored without being analyzed in detail, moreover, difficulties in restocking so that product expenditure data do not know the pattern of the data [4]. Sales transaction data is constantly increasing every day, causing the need for ample data storage. Oversized and large sales transaction data can be analyzed in terms of sales availability of goods [5]. The use of data mining with the Apriori algorithm allows transaction data to be reprocessed so that it can produce consumer purchasing patterns, where this information can help business owners make a business decision [6].

In its implementation, the a priori algorithm can be applied to a sales data management application or cashier application, which has the function of recording coffee powder sales transactions and providing the function of analyzing sales data contained in the database using the a priori algorithm [7]. The role of technology is huge in various aspects of life, without exception in the trade sector [8]. When buying products in stores, consumers will be offered various products ranging from packaged products to additional products and products with discounts [9] [10]. Various strategies in marketing products to increase sales in the hope that consumers will buy these products [11]. Making applications using the PHP programming language with the help of the Laravel framework and MySQL database applications, which are developed following the RAD (rapid application development) model software design method [12].

2. RESEARCH METHOD

2.1 Data Collection Methods

Data collection is very important in research because data is needed for the data[13] Some techniques used in this research, among others:

1. Observation

Observations were made to observe sales procedures that occurred both at the store and orders through social media. This is done to find facts that support the information obtained at the interview stage.

2. Interview

Interviews were conducted using open interview techniques. This was done so that the informant felt comfortable during the interview session, did not feel awkward, did not feel restricted, and could provide detailed information.

3. Study library

Literature study is carried out by studying electronic journals, books, and final assignments that are relevant to this research. Literature study was conducted to find variations of solutions that could be made for similar problems. Literature study was obtained from e-journal and repository sites of various universities.

2.2 Software Development Methods

The software development method that researchers use is the SDLC (system development life cycle) method with the rapid application development model [14], and this method is an incremental software model process that emphasizes short development cycles and high-speed adaptation of the waterfall model [15], where rapid development is achieved by using component-based construction approach. The RAD process allows a development team to create a fully functional system in a short timeframe [11]. The reason for this research is to choose the Rapid Application method Development (RAD) because the stages are structured, software development can be done in a fast time with an emphasis on the cycle that short, the more impressive the software developed results can be known without waiting a long time [16]. This can be done because the process is divided into modules, and the main reason for using the method Rapid Application Development (RAD) development is this development method will work well when applied to small-scale applications [17]. The stages of RAD are as follows:



Figure 1 Rapid Application Development Method

1. Requirement Planning

This is the first stage when the author comes to the Sompak Awe Jaya Cooperative and asks what systems are needed for companies engaged in savings and loan cooperatives. Deposit and loan transactions.

2. Workshop Design RAD

In this design stage, a multi-step process focuses on the design of making applications based on the results of the data obtained from the analysis stage, which will later be implemented. At this design stage, Entity Relationship Diagrams (ERD) and Logical Record Structures (LRS) are used for modeling database designs, and Unified Model Language (UML) diagram modeling, which consists of several diagrams, namely use case diagrams, activity diagrams, sequence diagrams, class diagrams, and deployment diagrams.

3. Implementation

In this stage, continue coding the program using the hypertext preprocessor (PHP) programming language, and Sublime Text as a text editor, and XAMPP, which is an application package containing Apache, MySQL.

2.3 Algoritma Apriori

The meaning of A Priori in general is an assumption or attitude that has been determined before (seeing, investigating) towards something [18]. Therefore the Apriori algorithm is included in the type of association rules in data mining [19] [20]. The algorithm is one of the algorithms that search for frequent item sets using the association rule technique. Support is the supporting value or percentage combination of an item in the database [7]. Meanwhile, confidence is the value of trust, namely the strength of the relationship between items in an a priori [21]. Confidence can be searched after the pattern of frequency of occurrence of an item is found [22]. The a priori algorithm uses previously known attribute frequency knowledge to process further information. The a priori algorithm determines the possible candidates by paying attention to the minimum support and confidence. The advantage of this algorithm is that it is simpler and can handle extensive data. While the weakness of using this algorithm has to scan the database every time it is done, so the time needed increases with more iterations [20].

The formula for finding support and confidence values

$$\text{Support}(A \cap B) = \frac{\sum \text{transactions containing items } A \text{ and } B}{\sum \text{total transactions}} \times 100 \%$$

$$\text{Confidence } P(B|A) = \frac{\Sigma \text{ transactions containing items } A \text{ and } B}{\Sigma \text{ total transactions } A} \times 100 \%$$

Apriori Algorithm Completion Steps To solve cases using the a priori algorithm, there are two basic methodological stages of association analysis [20]:

The formula for finding the support value of an item

a. High Frequency Pattern Analysis

This stage looks for item combinations that meet the minimum requirements of the support value in the database. The support value of an item is obtained by the following formula:

$$\text{Support (A)} = \frac{\text{transaction amount containing item } A}{\text{total transactions}}$$

While the Support value of 2 items is obtained by the following formula :

$$\text{Support (A, B)} = (P \cap B)$$

$$\text{Support (A, B)} = \frac{\Sigma \text{ transactions containing items } A \text{ and } B}{\Sigma \text{ transactions}}$$

b. Formation of Association Rules

1. After all the high-frequency patterns are found, we look for association rules that meet the minimum requirements for confidence by calculating the confidence of the association rules $A \rightarrow B$. The confidence value of the rules $A \rightarrow B$ is obtained from the following formula: While the workings of the a priori algorithm itself are divided into several stages called iterations, as follows: 1) Formation of itemset candidates, k-itemset candidates are formed from combinations of (k-1) itemsets obtained from previous iterations. One feature of the a priori algorithm is the pruning of k-itemset candidates whose subset contains k-1 items not included in a high-frequency pattern with k-1 length.
2. Calculation of support for each k-itemset candidate. Support for each k-itemset candidate is obtained by scanning the database to calculate the number of transactions that contain all items in the k-itemset candidate. This is also a feature of the a priori algorithm where calculations are required by scanning the entire database as long as the longest k-itemset.
3. Set a high frequency pattern. High-frequency patterns that contain k-item or k-itemset are determined from k-itemset candidates whose support is greater than the minimum support.
4. If no high-frequency pattern is obtained, then the entire process is stopped. If not, then k plus one and return to part 1.

3. RESULTS AND DISCUSSION

3.1. Activity Diagrams

Activity diagrams describe user activities on the system created, describe how an activity starts, decisions and conditions are formed, and how the system responds.

1. Activity Diagram Manage Supplier

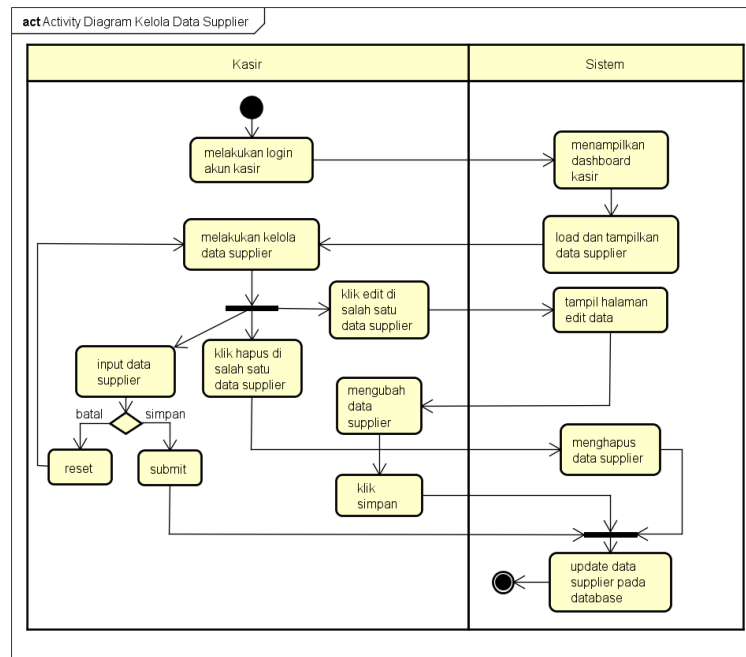


Figure 2. Activity Diagram Manage Supplier Data

Figure 2 generally describes the cashier process in updating supplier data where in the cashier system, you can edit, delete, add and update data on the system.

2. Activity Diagram Manage Customer

The following is an overview of the lending business process modeled in the form of an activity diagram. The results of the lending business process modeling can be seen in Figure III.2.

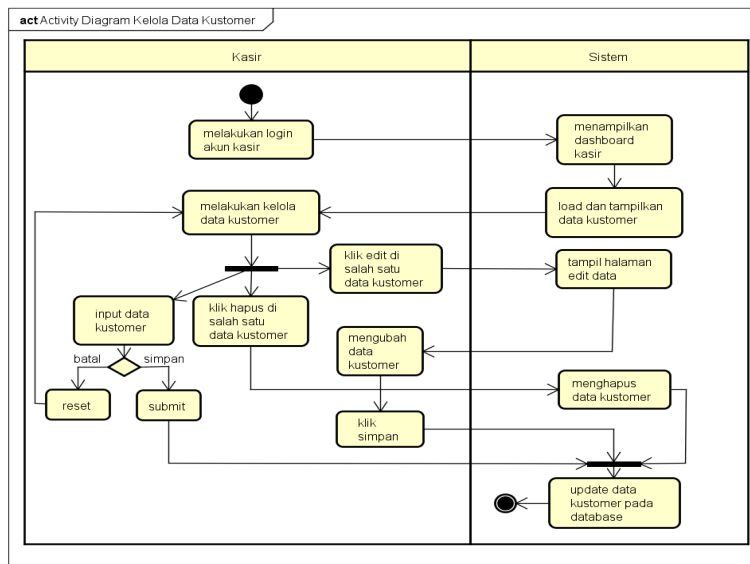


Figure 3. Activity Diagram Manage Customer Data

The following describes the report creation business process, which is modeled in the form of an activity diagram. The results of reporting business process modeling can be seen in Figure III.3.

3. Activity Diagram Processing Apriori

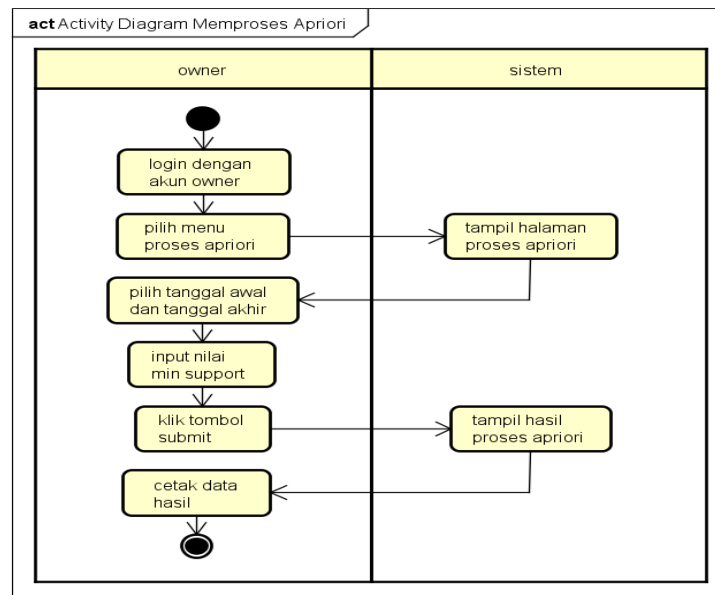


Figure 4. Activity Diagram Processing Apriori

Figure 4 can be explained the workflow of the system in the a priori process data form. When the user fills in support, confidence and range and then selects search, it will produce data to be processed; if one of the support, confidence and range data is empty, then the system will Ask to fill in the blank data. Then the user selects the process; the system calculates and produces the computed results.

3.2. Software Requirements Analysis

Functional requirements describe the types of requirements that contain any processes that can later be carried out by the system, also contain what information must exist and be produced by the system.

1. Cashier Needs

- a. Can manage supplier data
- b. Can manage purchasing data
- c. Can manage sales data
- d. Can manage customer data
- e. Can manage item data
- f. Can login

2. Owner's needs

- a. Can manage store data
- b. Can manage user data
- c. Can see the sales list
- d. Can see a list of purchases
- e. Can use a priori process

3.3. Designing Use Case Diagrams

Use case diagrams are used to show in general the functions and responsibilities of each actor in the coffee sales application. The use case diagram below describes the functions available to the cashier actor and the owner actor.

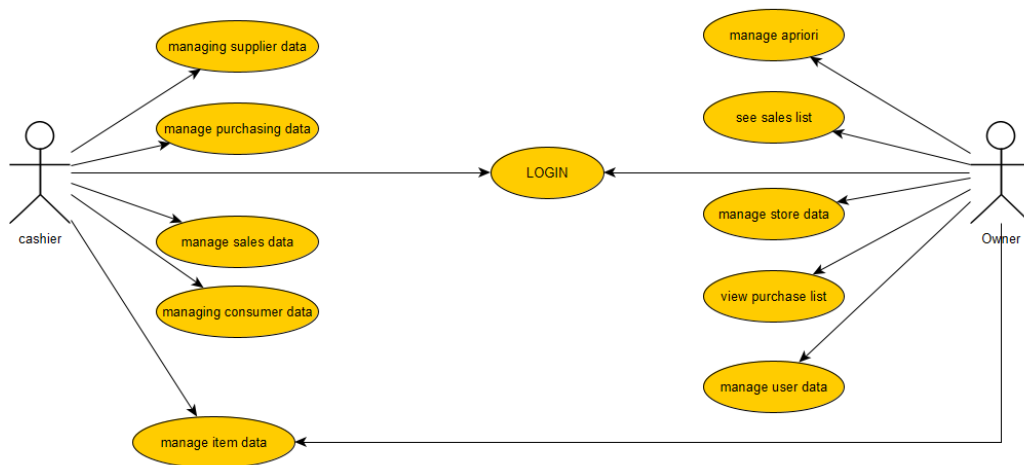


Figure 5. Use Case Diagrams

Figure 5 can be explained that the cashier can carry out the process of managing supplier data, managing purchasing data, managing sales data, managing consumer data, managing goods data. while the owner can do a priori management, view sales and purchase lists, manage store data, manage user data.

3.4. Sequence Diagram

Sequence diagrams describe the interactions between objects in and around the system (including users and forms).

1. Sequence Diagram Manage Supplier Data

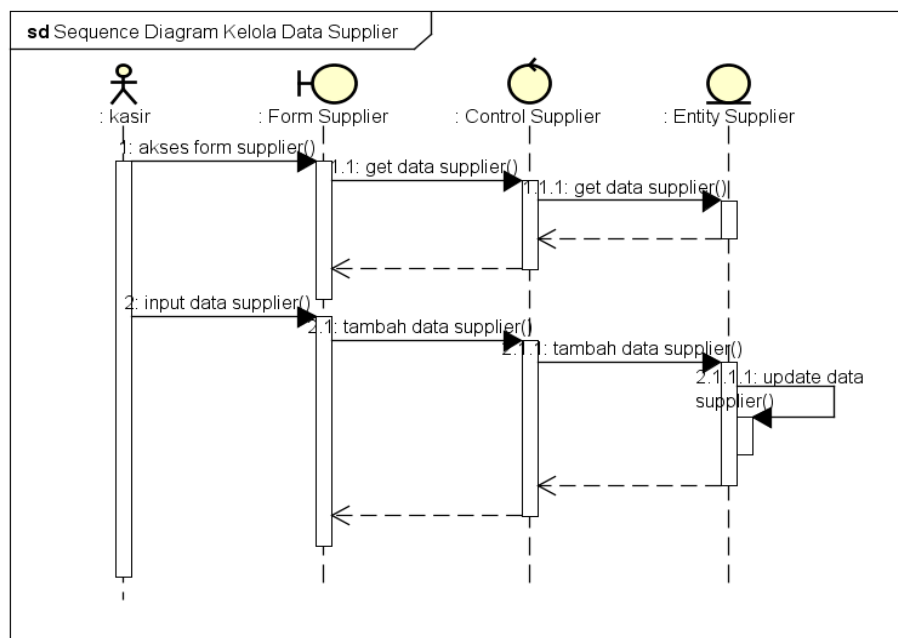


Figure 6. Sequence Diagram Manage Supplier Data

Figure 6 can be explained that cation can input supplier data, add supplier data and update data on supplier's form.

2. Sequence Diagram Manage Customer Data

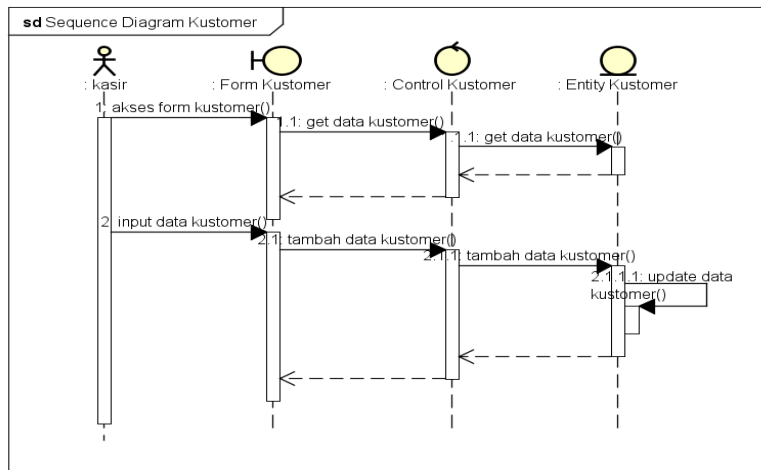


Figure 7. Sequence Diagram Manage Customer Data

Figure 7 can be explained that cation can input customer data, add supplier data and update data on customer forms

3. Sequence Diagram Manage Sales Data

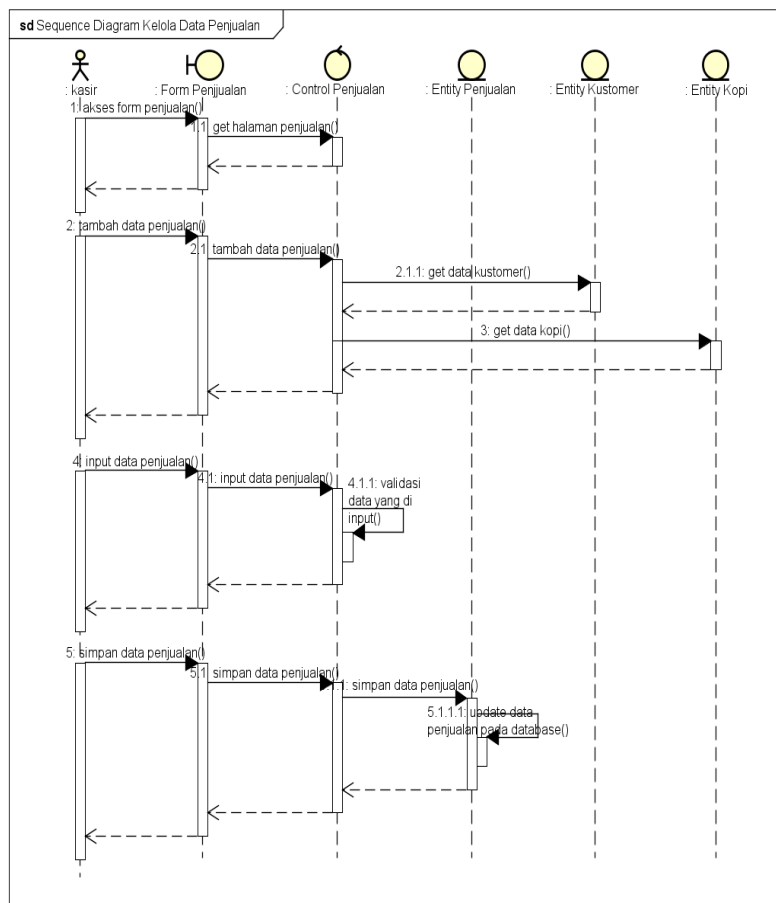


Figure 8. Sequence Diagram Manage Sales Data

Figure 8 Sequence diagram of sales depicts the owner accessing the sales list, where he can delete and edit sales data.

3.5. Class Diagrams

Class diagrams are used to describe the system structure in terms of defining the classes that will be made to build the system.

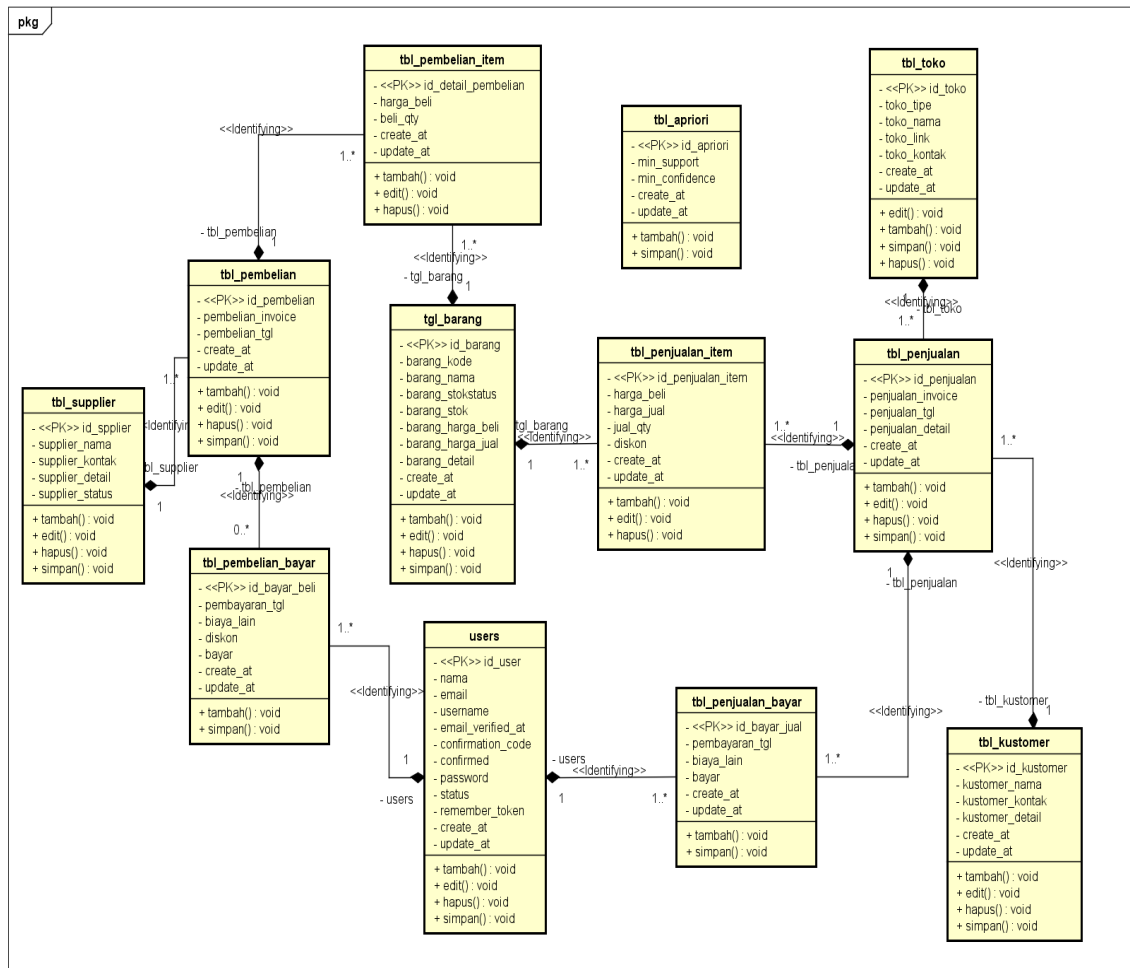


Figure 9. Class Diagrams

Figure 9 can be explained that the database has 11 tables where there are 10 related tables and 1 independent table. The user table can have one or more incoming cash tables. The supplier table can have many purchases, the consumer table can have many sales, the sales table has many stores and each sale has many items.

3.6 User Interface

1. Login User Interface

The login user interface is the default menu or is displayed first by the system before accessing the main page of the savings and loan processing accounting information system. Admin is required to fill in the username and password, then click the login button. Then the system will validate the username and password.

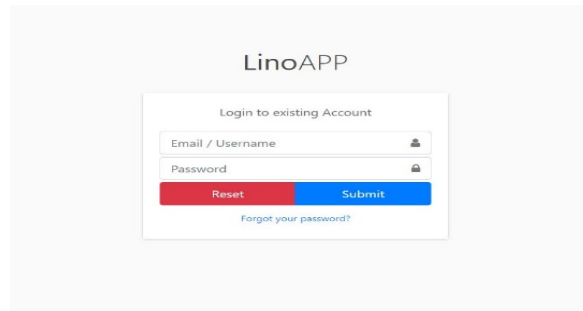


Figure 10. Login User Interface

Figure 10 The login user interface is the page used by the user to enter the application where in this view there is a form for entering the username and password to log in to the user's page.

2. Home Admin User Interface

The home user interface is a menu that appears after the admin accesses the login. This home menu contains master data, member loans, member savings and operational costs.

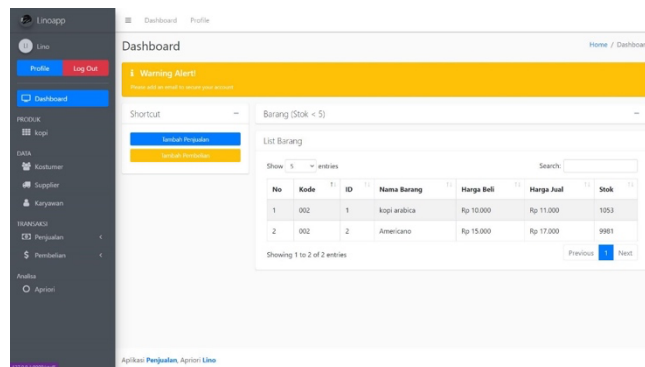


Figure 11. Home Admin User Interface

Figure 11 can be explained that the chairman's main menu section has several menu pages such as master data, transaction menus, report menus, and account and user settings menus. The system also provides a logout menu.

3. Member Data List User Interface

The user interface for the list of member data is a list managed by the admin. The display can be seen in Figure 12 as follows.

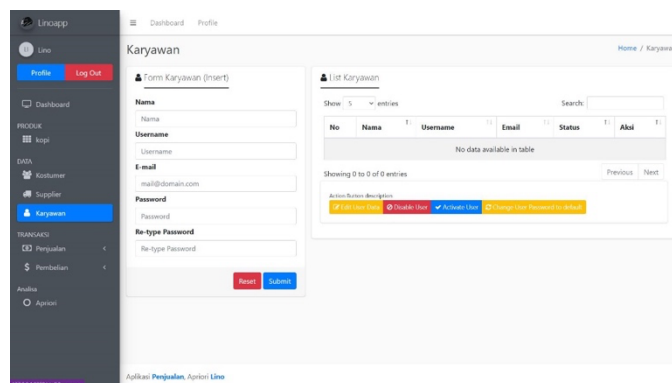


Figure 12. Member Data List User Interface

Figure 12 can be explained that the account settings data form contains a username, new password, password confirmation, full name, email, and photo change. The chairperson and cashier can manage pages with the save / save available features.

4. User Interface Add Installment Data

This user interface is a form for adding installment data which is managed by the admin. The display can be seen in Figure 13 as follows.

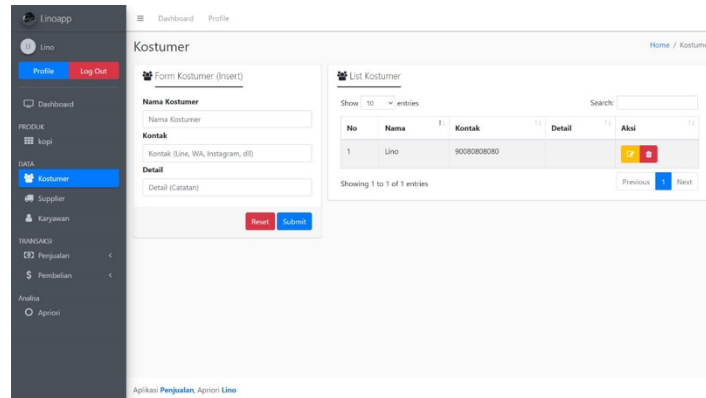


Figure 13. User Interface Add Installment Data

Figure 13 can be explained that the account settings data form contains a user name, contact number, contact detail. The chairperson and cashier can manage pages with the save / save available features.

5. User Interface Apriori

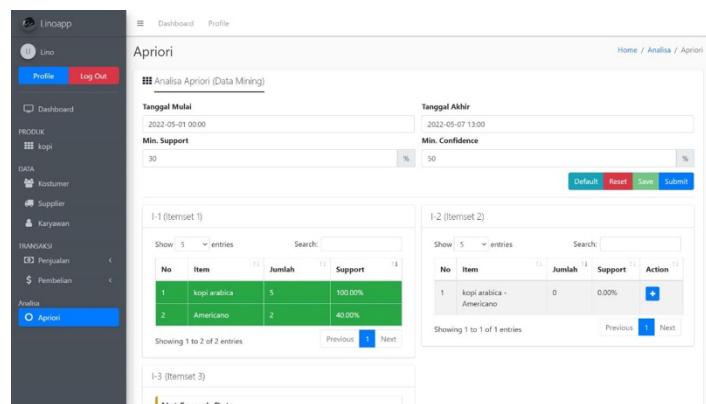


Figure 14. User Interface Apriori

Figure 14 can be explained that the Owner can use the function to process a priori, the Owner can determine which transaction date will be checked using the a priori algorithm

4. CONCLUSION

The web-based savings and loan processing accounting information system at this cooperative will facilitate the processing of savings and loan data. From the results of the research that has been done, the authors can draw conclusions about the several benefits of using application programs, including:

1. This study's results are cashier applications with features for managing coffee sales data using the association rule method with an a priori algorithm. The results of data processing using the Apriori algorithm are expected to help Simera Coffee Shop owners obtain new information from a collection of sales transaction data that can be used as material for determining sales strategies and marketing strategies, as well as information used to indicate when to add the stock.

2. The results of testing sales transactions using a system with manual calculations obtain the same results, meaning that the logic in the system can be said to be by the working rules of the a priori algorithm.

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