

Inventory Management System for MSMEs

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Abstract. This inquire about points to create a web-based stock framework that centers on reasonableness, user-friendliness, and usefulness custom-made to desires of Miniaturized scale, Little, and Medium Ventures (MSMEs). Through in-depth analysis of MSMEs' specific inventory management requirements, the system not only provides a comprehensive solution for stock management but also integrates the Apriori algorithm for associative analysis of inventory data. The system's development adopts an Agile approach, allowing flexible adaptation to changing needs throughout the development process. Key features include efficient stock management, intuitive Point of Sales (POS) transaction recording, and customizable inventory reporting. The implementation of this system is expected to enhance MSMEs' efficiency in inventory management, provide insightful data to support more informed decision-making, and positively contribute to strengthening competitiveness and growth in the dynamic and competitive business environment.

Keywords: Apriori Algorithm, Agile Methodology, Functionality, Inventory System, MSMEs

1 Introduction

Retail business players in the MSME category are often faced with challenges in planning, controlling stock and managing finances. One of the main obstacles faced is limited access to adequate information. This challenge arises because the transaction recording system is inadequate, especially in recording purchases, sales and inventory. This becomes an obstacle to obtaining the information sources needed to optimize business operations.

As a basis for this research, a study was carried out involving a literature review, namely, Design of an Information System for Inventory of Goods in MSMEs using Microsoft Excel at the Sumber Anugerah Motor Workshop. The use of Excel was chosen because administration and inventory management experienced problems. The qualitative descriptive research method was carried out at the Sumber Anugerah Motor Workshop, Buha Village, Environment 1. The results show that this system allows inventory control to computerized financial reports. Recommendations involve the adoption of designed application programs and training of employees in their use [1].

Furthermore, there is research on the application of a priori algorithms to web-based MSME inventory applications. The method used in this research is conducting analysis, system planning and using several diagrams such as use case diagrams, activity diagrams, sequence diagrams and class diagrams. This research resulted in a web-based inventory application created for MSMEs [2]. Then there is another research, namely the inventory information system for MSME resellers of basic goods, the research method uses the waterfall model. This research resulted in a web-based application for an inventory information system for MSMEs [3]. The application of information technology that is widely used in the business world is the application of web-based point-of-sale, inventory and cashier information systems [4]. The application of technology by MSME actors to their businesses, including information technology, has an effect on income [5].

Therefore, this research aims to develop and implement a web-based inventory system specifically designed to support MSMEs. This system will prioritize affordability and ease of use. With this solution, it is hoped that MSMEs can increase efficiency in inventory management, reduce overhead costs and optimize sales opportunities. In addition, this system is also expected to provide better insight into inventory performance, enabling MSME owners to make more informed decisions.

2 Research Methodology

2.1 Research Stages

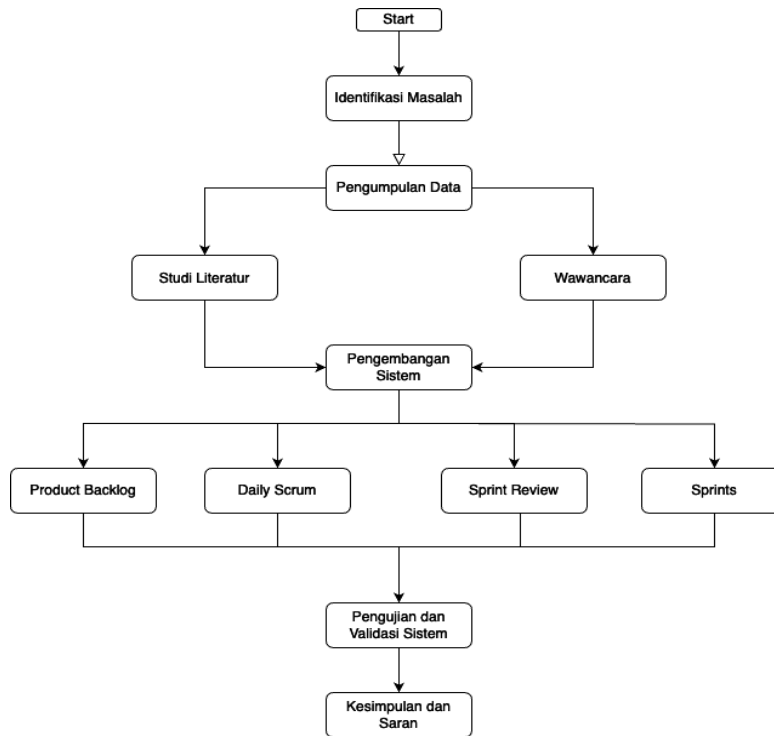


Figure 1. Research Stages

- a. Problem Identification: Identify the problem or need to be solved by conducting an in-depth analysis related to the variables to be studied.
- b. Data Collection: Data collection is divided into several processes, namely:
 1. Interview: Conduct interviews with stakeholders, experts, or related parties, namely MSMEs to gain valuable perspectives and inputs.
 2. Literature Study: Collect data from scientific sources, journals, books, and related research to understand the theoretical basis and the latest findings related to the problem.
- c. System Development: Apply Agile methods in system development. The stages include:
 1. Product Backlog: Creates a priority list of features and tasks that must be implemented in the system.
 - Sprints: Break down work into short iterations called sprints, which last 2 weeks.
 2. Daily Scrum: Daily meetings to discuss progress, bottlenecks, and teamwork plans.
 3. Sprint Review: Evaluate the results of completed sprints to ensure features and functionality have been implemented properly.
- d. System Testing and Validation: Testing systems to ensure performance, security, and functionality meet expectations.
- e. Conclusions and Suggestions: Make conclusions from the results of the study, highlighting the main findings and their practical implications. Provide recommendations for further actions or further development.

2.2 Apriori Algorithm

The definition of an algorithm is an effective method expressed as a limited series of well-explained instructions for calculating a function. Association analysis or association rule mining is a data mining technique for finding associative rules between a combination of items. An example of an associative rule from purchasing analysis in a supermarket is knowing how likely a customer is to buy bread together with milk. [6].

The a priori algorithm is one of the most popular algorithms in data mining in the association group. This algorithm will be suitable to be applied if there are several item relationships that you want to analyze. One way that can be applied is in the area of inventory data grouping [7].

2.3 Agile Method

Agile methods are fast methods for developing software that adapts quickly to changing needs. The main idea of Nimble Improvement is application development and collaboration. Reduce documentation so you can concentrate on working on your application. Close collaboration and communication between two or more people working on a single feature. The goal of Agile development in the form of literacy or iteration, is to respond and handle each change in a flexible way, thereby reducing project duration and ensuring client satisfaction. Agile development methods are good for small projects and small teams [8].

2.4 Inventory

Inventory, which includes all goods or materials needed in the production and distribution process that are used for further processing or sold [9].

2.5 Website

A website is a collection of electronic pages that are interconnected and can be accessed via the Internet [10]. Apart from that, there are those who state that a website is a collection of web pages that can be accessed via a specific domain or address on the internet. Each web page on this website contains information which can be in the form of text, images, videos, or other multimedia elements. This information is structured and organized in such a way as to provide a structured and informative user experience. Websites can cover various topics, from news, education, entertainment, business, to online communities [11].

3 Result and Discussion

3.1 System Planning

- a. Use Case Diagram

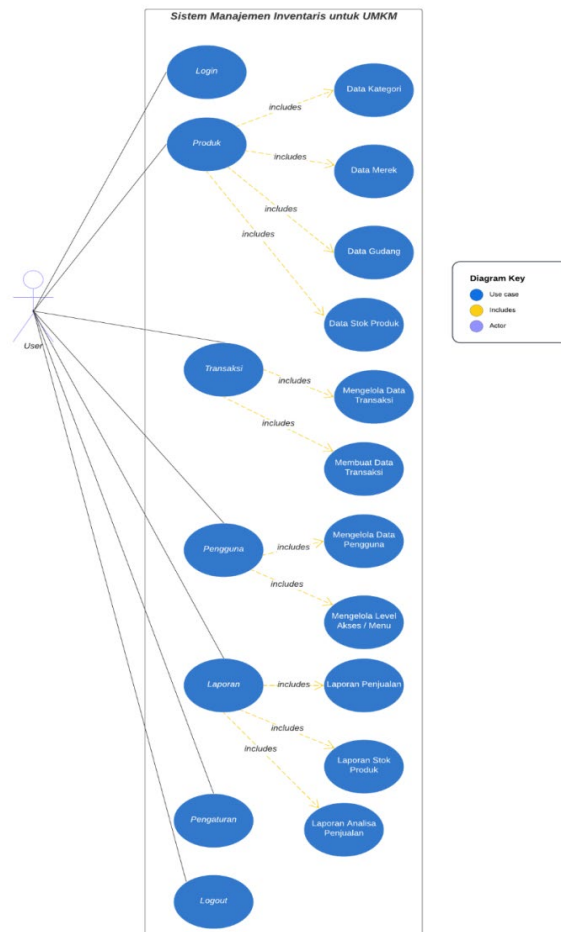


Figure 2. Use Case Diagram

b. Login User Activity Diagram

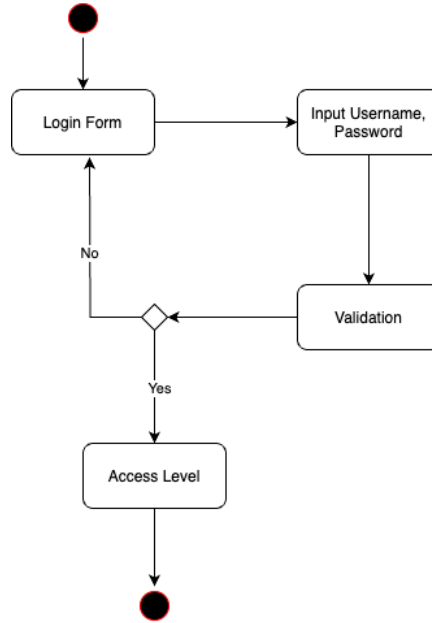


Figure 3. Login User Activity Diagram

c. Product Management Activity Diagram

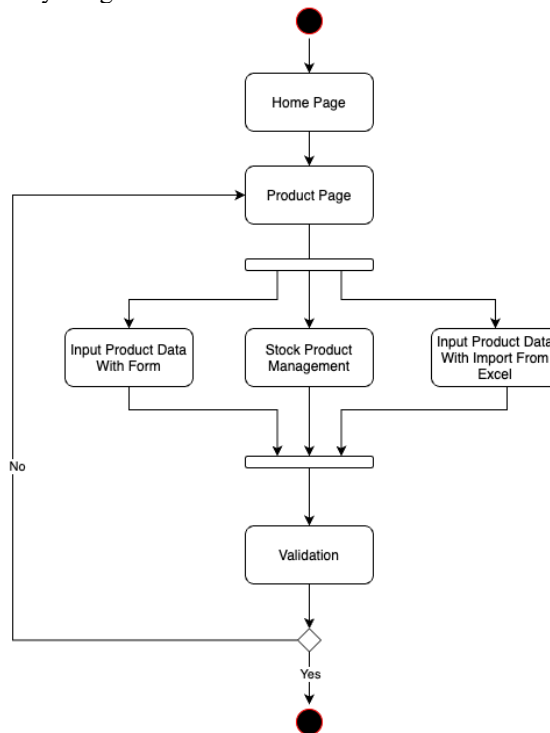


Figure 4. Product Management Activity Diagram

d. Transaction Management Activity Diagram

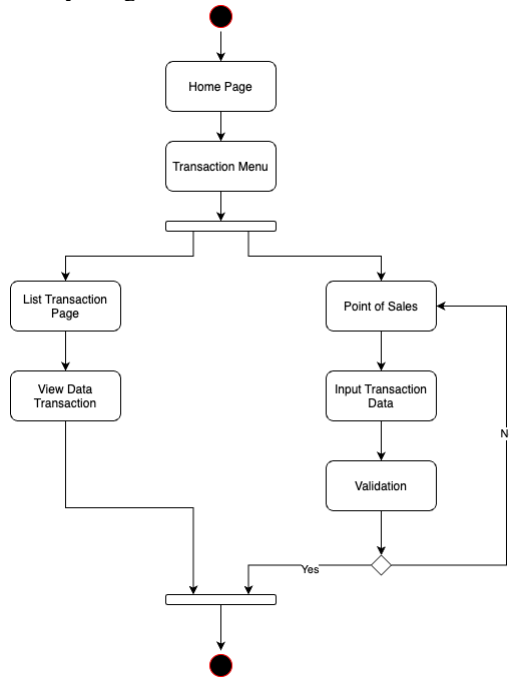


Figure 5. Transaction Management Activity Diagram

e. User Management Activity Diagram

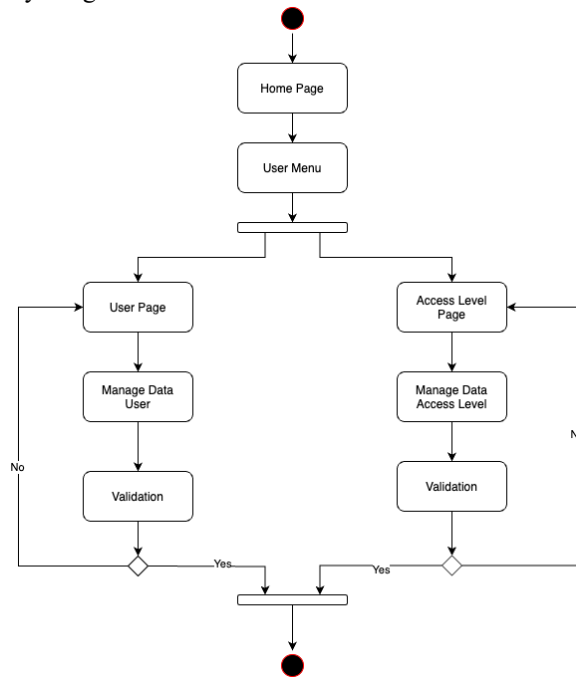


Figure 6. User Management Activity Diagram

f. Report Management Activity Diagram

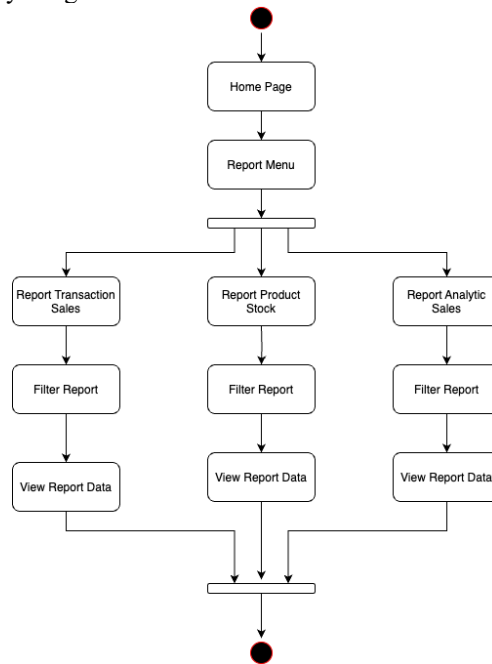


Figure 7. Report management Activity Diagram

g. Class Diagram



Figure 8. Class Diagram

3.2 Data Collection

Sales transaction data collection began to understand purchasing patterns in MSMEs. Sales data will be the basis for developing association models with the aim of finding relationships between items that have been sold. This modeling process involves calculating support values and confidence values, which will be the basis for analyzing association relationships between items. An association rule is considered significant if the support value exceeds the minimum support value and the confidence value exceeds the specified minimum confidence

value. In this context, the Apriori algorithm is used to identify relationships between items, and the analysis results will be used by the admin to provide recommendations for potentially related items.

3.3 Implementation of Apriori Algorithms

The author uses sales data taken from the period 10 November 2023 to 21 November 2023

Table 1. Sales Transactions

Transaction Date	Product Name
10 November 2023	Lego, Barbie, Hot Wheels, Puzzle
11 November 2023	Barbie, Action Figure, Puzzle
12 November 2023	Lego, Barbie, Action Figure, Puzzle
13 November 2023	Barbie, Puzzle
14 November 2023	Lego, Action Figure, Hot Wheels, Puzzle
15 November 2023	Lego, Barbie, Hot Wheels
16 November 2023	Action Figure, Puzzle
17 November 2023	Barbie, Puzzle
18 November 2023	Lego, Barbie, Action Figure, Hot Wheels
19 November 2023	Barbie, Puzzle
20 November 2023	Lego, Action Figure, Puzzle
21 November 2023	Hot Wheels, Puzzle

After that, continue to identify the frequency of appearance of each individual item (1-itemset) in the toy transaction dataset. For example, Lego appears 7 times, Barbie appears 8 times, and so on. The detailed data are in table 2.

Table 2. Support Itemset Value 1

Nama Barang	Frequency
Lego	7
Barbie	8
Action Figure	5
Puzzle	9
Hot Wheels	4

The next step involves forming itemset 2 (2-itemset) by combining items from itemset 1. The author calculates the frequency of appearance of each itemset 2 in transactions. For example, {Lego, Barbie} appears 4 times, {Barbie, Puzzle} appears 5 times, and so on. The details are in table 3.

Table 3. Item Support Value Itemset 2

Product Name	Frequency
{Lego, Barbie}	4
{Lego, Action Figure}	2
{Lego, Puzzle}	4
{Barbie, Action Figure}	4
{Barbie, Puzzle}	5
{Action Figure, Puzzle}	3
{Hot Wheels, Barbie}	2
{Hot Wheels, Action Figure}	1
{Hot Wheels, Puzzle}	1

Next, itemset 3 (3-itemset) is created by combining itemset 2. The author calculates the frequency of appearance of each itemset 3 in transactions. For example, {Lego, Barbie, Puzzle} appears 2 times, {Barbie, Action Figure, Puzzle} appears 3 times, and so on. The details are in table 4

Table 4. Item Support Value Itemset 3

Nama Barang	Frequency
{Lego, Barbie, Puzzle}	2
{Barbie, Action Figure, Puzzle}	3

In the final step, the author forms association rules by setting support and confidence values. In this example, the resulting association rule is that when customers buy Barbies and Action Figures, they are also more likely to buy Puzzles, with a confidence level of 75.0%. The details are in table 5

Table 5. Association Rule Results

Product Name	Support	Confidence
{Barbie, Action Figure} => {Puzzle}	3	75.0%

3.4 System View

In the image below, you can see the interface of the Inventory Management System for MSMEs. This system is designed to efficiently manage goods data and sales data.

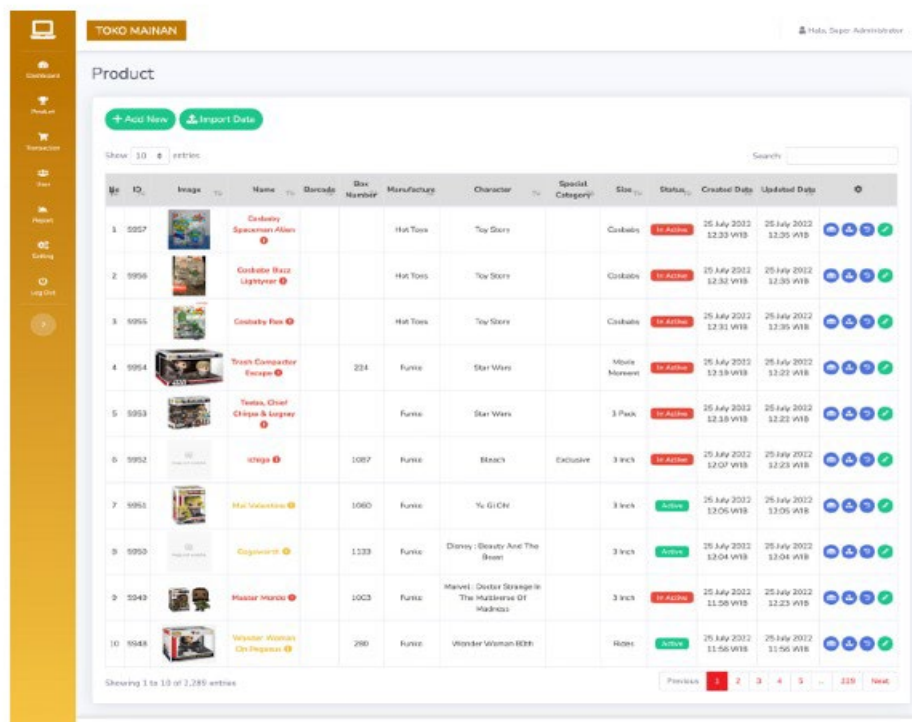


Figure 7. System View

3 Conclusion

This research succeeded in developing a web-based Inventory Management System specifically designed to support Micro, Small and Medium Enterprises (MSMEs). With an Agile approach, this system offers affordable, easy-to-use, and functional solutions according to the needs of MSMEs. A priori algorithms are used in the analysis of inventory data associations, providing the ability to identify patterns of relationships between goods. The results showed that the implementation of the system can improve the efficiency of MSMEs in inventory management with key functions such as stock management, sales recording through intuitive POS, and customized inventory reporting. In addition, this system can provide goods recommendations to customers through data association analysis, improve sales strategies, and provide significant added value for MSMEs. The suitability of the system to the MSME business environment is reflected in the affordability and ease of use approach, which effectively supports the growth and competitiveness of MSMEs in a dynamic business environment.

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