Research Article

Empowering MSMEs with Data-Driven Insights: Mobile Sales Dashboard Application for MSMEs

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A B S T R A C T

Micro, Small, and Medium Enterprises (MSMEs) in Indonesia have contributed significantly to GDP and the workforce, but still face challenges in managing sales data and making data-driven decisions. Manual recording often causes operational inefficiencies, recording errors, and delays in business analysis. Based on the previous problem, this study develops a mobile-based sales dashboard application to help MSMEs analyse data in real-time and improve business strategies. The methodology used is Design Science Research (DSR) with a Rapid Application Development (RAD) approach for rapid and iterative development. This application was developed using Java and Firebase and provides sales summary features, best-selling cashiers, best-selling products, and less popular products, with time filters and graphical data visualization. Testing using Black Box Testing shows that all features run well, while the User Acceptance Test (UAT) results show that 90.625% of users feel that this application is easy to use and suits their needs. These results indicate that the application can improve operational efficiency and business transparency and support data-driven decision-making for MSMEs.

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) are the backbone of the Indonesian economy. [1]. Based on data reports from the Ministry of Cooperatives and SMEs, the contribution of MSMEs to the National Gross Domestic Product (GDP) reached 60.5%, indicating that this sector has great potential to continue to be developed to improve the national economy [2], [3]. However, even though MSMEs have a significant role, they still face various challenges in managing their business, such as limited resources, inappropriate procedures in managing sales transactions, unclear bookkeeping, and still carrying out manual recording processes [4], [5].

Currently, most MSMEs still record transactions manually using pens and paper. [6]. This conventional method causes low operational efficiency, difficulty in monitoring product stock, and slow business decision-making processes [7]. In addition, rapid technological developments also require MSMEs to adapt to digital transactions, but many MSME actors are still unable to implement digitalization systems in their business operations [8].

For some MSME owners, recording transactions and making financial reports is complex. Difficulty in preparing good financial reports can hinder other business opportunities [9]. In addition, the management of online sales data, which is still done manually, can also cause obstacles in recording products and sales, which in turn causes inefficiency in managing transactions and sales reports [10].

Previous studies have tried to overcome this problem by developing various technological solutions. One approach that has been implemented is using an Excel-based recording system [11]. However, utilizing Excel still has several limitations, such as MSMEs having difficulty managing transaction data because

they have to summarize transaction data from different Microsoft Excel sheets or files. In addition, preparing financial reports also takes time, so there can be delays in preparing financial reports [12].

In addition, other studies have developed a website-based financial recording system [9], [13], [14], [15]. This system makes it easier for MSMEs to manage their business with more structured data recording. However, this website-based financial recording requires MSMEs to use a laptop or computer to access the website, this is less practical for MSMEs who more often use mobile phones in their daily activities, in addition, the website display is usually not optimized for mobile displays, such as being less responsive and difficult to use on devices with small screen sizes such as mobile phones [16].

Data from We Are Social Indonesia 2024 showed that mobile phone users reached 5.61 billion in early 2024. This indicates that 69.4 percent of the world's total population now uses mobile devices [17]. With the increasing use of Android-based smartphones among the public, including MSMEs, there is an excellent opportunity to integrate digital transaction applications that support more effective business management [8].

Based on this opportunity, several other studies have tried to develop Android-based transaction recording applications for culinary-based MSMEs in Mataram City. However, the application developed is only for recording transactions, and there is no sales report dashboard. [18]. In addition, there is also research that develops transaction recording and sales report applications for Amplang Samarinda MSMEs. However, the dashboard created in this study has a straightforward and less interactive appearance; moreover, the information displayed is only related to sales summaries and turnover. [19]. Similar to research that develops transaction recording applications using Flutter and Firebase, the available dashboard only displays sales summary information. Besides, the application developed in this study also has a license, so users must subscribe to use this application [6].

Based on the limitations of previous research, this study will design and develop an MSME mobile-based sales dashboard application that can help MSME actors conduct sales transactions and analyse sales data more easily and at a lower cost. This MSME sales dashboard application provides data visualization regarding sales summaries, sales profits, best-selling products, and other information so that, through this information, MSME owners can monitor the performance of MSME stores, identify sales trends, and make strategic decisions based on data.

This research contributes to MSMEs and researchers in similar fields. From the perspective of MSMEs, this research offers an application-based solution that is easy for MSMEs to adopt to improve the ease of managing MSME businesses. From a research perspective, this research fills the gap in implementing data-based dashboards for MSMEs, especially in mobile applications. With this solution, MSMEs can be more empowered to face business challenges in the digital era, increase operational efficiency, and increase their competitiveness in the market.

2. METHOD

The method used in this research is design science research (DSR). This method solves real-world problems through a design-based approach and system development. [20]It has several stages, namely problem identification, determining objectives and solutions, design and development, demonstration, and evaluation [20], which can be seen in Figure 1.
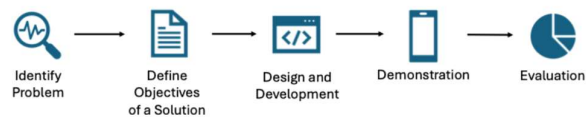

Figure 1. Research Methodology

The object of the case study used in this study is Cibodas Village. Cibodas Village is in Pasirjambu District, Bandung Regency, West Java Province. This village has diverse potential, ranging from nature tourism, agriculture, and plantations to cultural tourism and creative industries. The growth of MSMEs in Cibodas Village is also relatively rapid, covering various fields such as culinary, local crafts, and processed agricultural and plantation products, where BumDes Laksana Maju Cibodas directly supports these business units or MSMEs [21].

At the problem identification stage, researchers identify problems by conducting literature studies on related topics, namely mobile-based MSME dashboard applications. Researchers also conduct interviews and direct observations with MSME actors in Cibodas Village to identify the problems faced. The information obtained through literature studies and direct interviews will be input into the problem identification stage. The issues that have been determined will be used to determine the objectives and solutions for the study. Based on the problems that have been identified, this study will develop a mobile Android-based MSME sales report dashboard.

Next, in the Design and Development stage, a mobile-based MSME sales report dashboard will be designed and developed, at this development stage using the SDLC Rapid Application Development (RAD) method. RAD is a software development methodology that focuses on creating prototypes with a fast and structured development process [22]. Developing an application may take about 6 months, but application development can be completed in less than 1 to 3 months using the RAD method. [23]. The RAD method was chosen because it focuses on developing prototypes and a fast development process, so the application is expected to be ready for use in a relatively short development time. The stages in RAD are requirements design, system design, system development, testing, and implementation. [24], which can be seen in Figure 2.
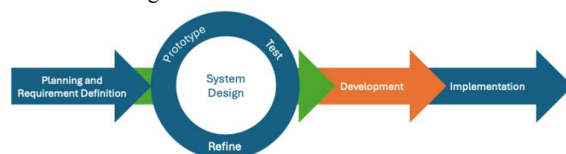

Figure 2. RAD Development Method

In the first stage, Planning and Requirements Definition, the system requirements are defined through direct interviews with 8

MSME actors in Cibodas Village. At this stage, the developer identifies the needs related to the sales recording application and dashboard by determining the main features, such as the ability to input new products, make transactions, and view the dashboard display. The application requirements can be seen in Table 1.

Table 1. Application Requirement

Id	User	Necessity
1	Admin	Managing the Store
		Managing Products
		Managing Discounts
		Managing Users
		Managing Product Categories
		Sales Reports and Dashboards
2	Cashier	Manage transactions
		Sales Reports and Dashboards

Next, in the user design stage, users are directly involved in designing the initial prototype of the system. Developers create wireframes and interactive prototypes to get feedback from users. This prototype is continuously refined until approved by the user. The following is a prototype of the dashboard that will be built, a dashboard display with several types of relevant graphs. Some of the information displayed on the dashboard is sales summary information, best-selling cashier information, best-selling product information, and less popular product information. The dashboard prototype can be seen in Figure 3.
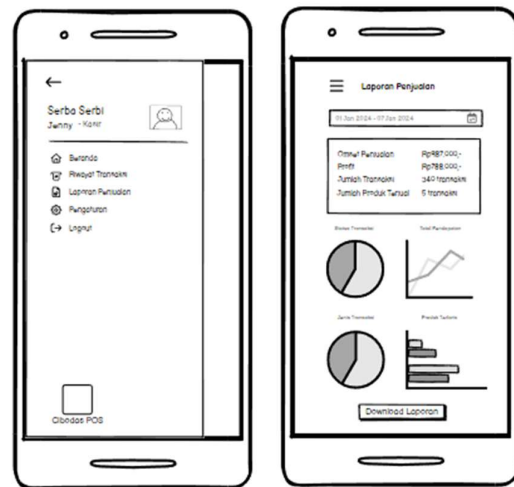

Figure 3. Dashboard Prototype

At this stage, use case diagrams and class diagrams are also designed. This use case diagram illustrates the interactions between system users and the system functions [25]. The admin manages the overall system, including registering new cashier accounts, handling store operations, managing products and discounts, and assigning cashiers. Cashiers have a limited scope and are mainly responsible for processing transactions. Both the admin and cashier can access sales analytics reports, which include sales summaries, best-selling products, and least-selling products. However, the best-selling cashier information can only be accessed by the admin. Access control ensures that each role has specific permissions, enhancing system security and efficiency. The use case diagram can be seen in Figure 4.
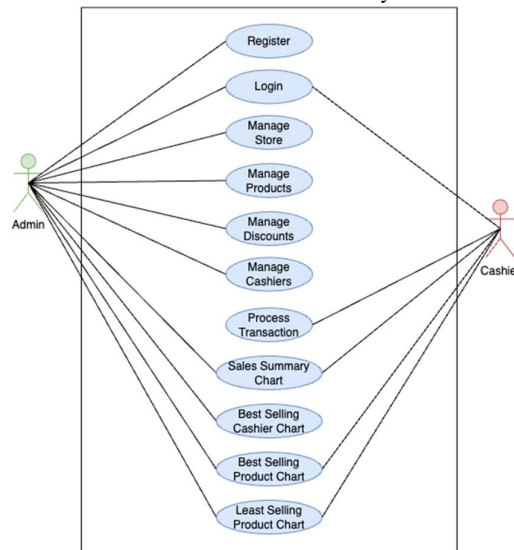

Figure 4. Use Case Diagram

This class diagram describes the type of database system structure by showing the class, its attributes, methods, and relationships between objects in the system. [26]. The class diagram in this application consists of several main entities: Outlet, Products, Transactions, Users, Discount, Product_Category, and Transaction_Item. The class diagram can be seen in Figure 5.
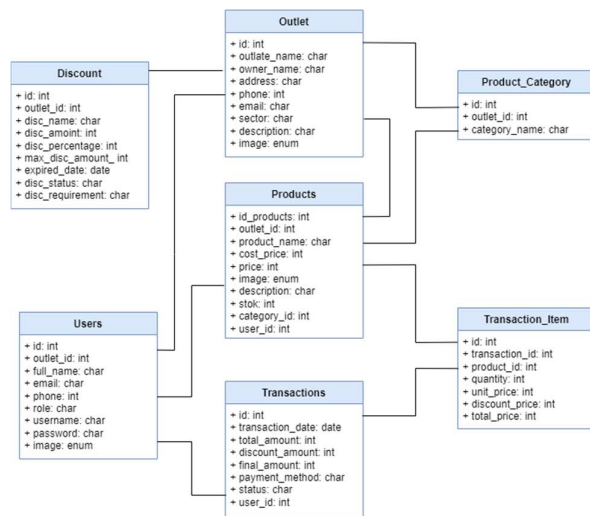
Figure 5. Class Diagram

The outlet entity contains information about the store, including the outlet name, address, email, business sector, description, and image. The user entity records user data such as full name, email, phone number, user role, username, password, and profile picture. The products entity contains information about products sold at the outlet, including cost price, selling price, description, stock, product category, and the outlet and user who added the product.

Furthermore, the transactions entity records customer transaction data, including the transaction date, total amount, discount given, final amount, payment method, and transaction status. Each transaction is associated with a specific user. The transaction_Item entity represents the details of each transaction, including the product purchased, purchase amount, unit price, discount applied, and total price. The discount entity stores information about promotions or discounts available at the outlet, including discount name, discount amount, discount percentage, expiration date, and discount status—the Product_Category entity groups products based on specific categories, helping in more structured product management.

The relationship between entities reflects the functional relationship in the system; for example, an outlet can have many products, one transaction can have many Transaction_Items, and each product has one category. This structure allows efficient sales, user, and product data management in a digital-based business system.

Next, in the development stage, the developer builds a system based on the agreed prototype. The Android-based sales recording and dashboard application is developed using Java, with Firebase-based database storage. To secure MSME transaction data, the system can implement user authentication using Firebase Authentication, ensuring only authorized users can access the system. [27]. In addition, Firestore Security Rules can be used to set role-based access rights, such as limiting cashiers to only being able to see their transactions while admins have complete access. With these steps, the application can improve data security, reduce the risk of information leakage, and ensure user trust in the system.

Key features like transaction recording and report dashboards are developed modularly and equipped with initial testing to ensure functionality. If the application development has been completed, then at the demonstration implementation stage, the MSME application that has been developed will be used directly by MSME actors to prove the suitability of the application's needs and functions, and the evaluation stage is carried out to assess the performance and effectiveness of the solution based on predetermined criteria. Evaluation is done by testing the application features' functionality using the black box testing method and user feedback questionnaires. Based on the results of this evaluation, if the solution does not meet expectations, improvements or iterations can be made to achieve the results required by MSME actors.

3. RESULT

The results of this study focus on developing an Android Mobile-based MSME sales report dashboard. The application is developed with an easy-to-understand design, such as color determination, button placement, and other features, hoping that users can use and understand this application more easily. In the development of this dashboard, some information is displayed, namely sales summary information, best-selling cashier information, best-selling product information, and less popular product information.

Two types of users can use the application, namely, cashiers and admins. On the admin dashboard display, admins can see sales summary information for all stores, best-selling cashier information for all stores, best-selling product information, and less popular product information for all stores. Meanwhile, if the user logs in as a cashier, the cashier can only see sales summary information for their store, best-selling product information, and less popular products in their store. In contrast, on the cashier account dashboard, there is no best-selling cashier information. Access to this information is provided to provide information appropriate to the type of user. The login page can be seen in Figure 6.
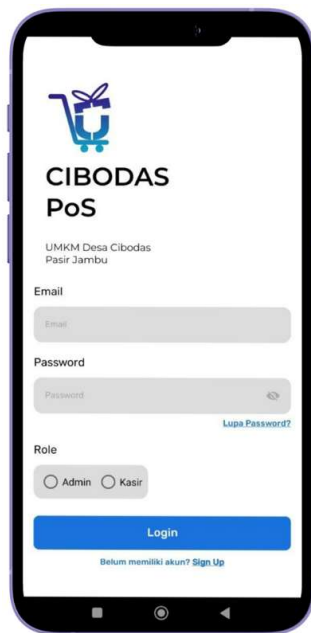.

Figure 6. Login Page

This dashboard also has a date filter feature. This filter makes it easier for users, admins, and cashiers to filter sales reports by a specific period. Filters are available in the last 7 days, the previous 30 days, and the set date filter. If the user wants to filter other than the last 7 and 30 days, then the user can use the set date filter. The filter feature can be seen in Figure 7.
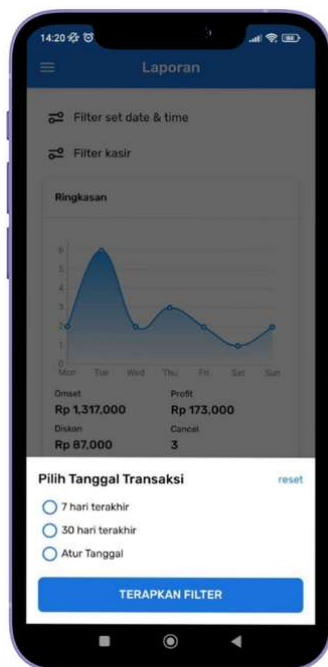

Figure 7. Filter Feature

The sales summary dashboard displays information regarding successful sales per a specific period as a line chart. In this graph, the horizontal axis (X) shows the day of the week (Mon-Sun). In contrast, the vertical axis (Y) shows the total transactions successfully made by customers. The line connecting the data points shows the change in value from one day to the next,

making it easier to see the increase and decrease in sales each day through this graph. In addition, this summary display also contains the total sales turnover per specific period, total profit, total discounts successfully used by customers, and total transactions canceled by customers. This information lets admins and cashiers quickly find information on total transactions, turnover, profit, discounts, and canceled transactions. The sales summary page can be seen in Figure 8.

Figure 8. Sales Summary

Next, on the best-selling cashier dashboard display, the graph displayed uses a bar chart. In this graph, the horizontal axis (X) shows the total transactions at the cashier, while the vertical axis (Y) shows a list of cashier names. This graph displays the best-selling cashiers in all stores over specific periods, the name of the cashier who served the transaction with the highest total successful transactions, and the number of successful transactions that occurred at the cashier. This graph makes it easier for MSMEs to find the best-selling cashiers and the total successful transactions made by each cashier. This graph shows that the best-selling cashier information displayed is limited to the top 5 best-selling cashiers for a specific period. However, this best-selling cashier dashboard display only appears on the dashboard with an admin account. The best-selling cashier page can be seen in Figure 9.

There is a dashboard display with information on the best-selling products. The graph displayed uses a bar chart. In this graph, the horizontal axis (X) shows the total products sold, while the vertical axis (Y) shows a list of product names. This graph shows information on the best-selling products in all stores over a specific period, the name of the product with the highest total sales, and the number of products sold. In this graph, the best-selling product information displayed is limited to the top 5 best-selling products. The best-selling product can be seen in Figure 9.
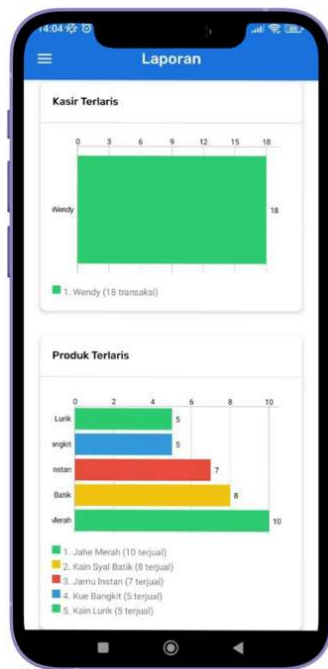
Figure 9. Best Selling Cashier and Product

Moreover, there is a dashboard display with information on less in-demand products. This dashboard displays information on the product's name that is less in demand, the product's price, the total remaining stock, and the total stock of the product sold. Moreover, there is a progress bar for the stock. If the product has not been sold, the stock progress bar will be full blue, but if several products are sold, the stock progress bar will decrease according to the amount of stock sold. The least selling product can be seen in Figure 10.

Hopefully, this dashboard can overcome the problems that occur in MSME actors. Previously, calculating total transactions, turnover, profit, discounts, and canceled transactions was carried out manually. Of course, it took time and allowed for miscalculations or human error, and it often lost records, so the calculation could not be known as a whole. In addition, MSME actors also have difficulty finding out the best-selling cashier, best-selling products, and less in-demand products, so that with

this dashboard, it can make it easier for MSME actors to find out sales reports and find out information on the best-selling cashier, best-selling products, and less in-demand products quickly. This dashboard is expected to help in data-based decision-making to increase MSME sales in the future.
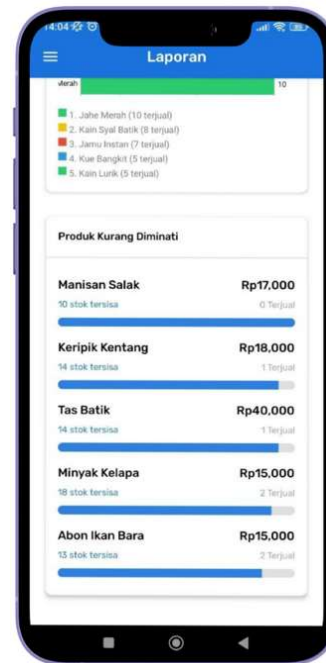

Figure 10. Least Product Selling

4. DISCUSSION

4.1. Black Box Testing

The developed system will be tested using the black box testing method. This method focuses on analyzing output without knowing how the internal system works. In the black box testing method, the tester tests the external application. This method involves running the software and verifying if it fulfills the user's initial requirements without examining its source code. [28]. A team of 5 application testers carries out black box testing. The test result can be seen in Table 2.

Table 2. Black Box Testing

Id	Test case	Role	Expected result	Actual result	Status
A.1	Login	Admin, Cashier	Successfully logged in according to the role	Successfully logged in according to the role	Succeed
A2	View sales summary	Admin, Cashier	Can view the sales summary	Can view the sales summary	Succeed
A3	See the best-selling cashier	Admin	See the best-selling cashier	See the best-selling cashier	Succeed
A4	Transaction date and time filter	Admin, Cashier	Transaction date and time filter	Transaction date and time filter	Succeed
A5	Cashier filter	Admin	Cashier filter	Cashier filter	Succeed
A6	See best-selling products	Admin, Cashier	See best-selling products	See best-selling products	Succeed
A7	Seeing products that are not in demand	Admin, Cashier	Seeing products that are not in demand	Seeing products that are not in demand	Succeed

Based on the test results, the system has successfully run its functions well. Testing is done with some scenarios to test whether the systems function well, with a 100% success test result.

4.2. User Acceptance Test

User Acceptance Testing (UAT) is carried out directly on MSME actors to determine the level of user acceptance of an application and the extent to which users understand the application-based solution being developed. [28]. The user acceptance result can be seen in Table 3.

Table 3. User Acceptance Test

Id	Question	STS (%)	TS (%)	N (%)	S (%)	SS (%)
P1	I'm thinking of using this system again.	-	-	-	50%	50%
P2	I find the system easy to use	-	-	12,5%	50%	37,5%
P3	I don't need help from other people or technicians using this system.	-	-	25%	75%	-
P4	I feel that the features of this system are working correctly and according to my needs.	-	-	-	37,5%	62,5%
Total				9,375%	53,125%	37,5%

Description: SS = Strongly Agree, S = Agree, N = Neutral, TS = Disagree, STS = Strongly Disagree.

Based on feedback from 8 users who conducted a direct application trial, the application that has been developed received a very positive response. The total number of respondents who agreed and strongly agreed was 90.625%, indicating that this application has met the goals and needs of users. The feedback results showed that all respondents stated that they would use this system again and that all the features of the system were running well. The features in the application were based on user needs, and most respondents stated that this system was easy to use and did not require help from others to use the system. However, 9.375% of respondents answered the neutral option, which will be the basis for evaluating future application improvements to improve the goals and meet the users' needs.

5. CONCLUSION

This study successfully designed and developed a mobile-based sales report dashboard application for Micro, Small, and Medium Enterprises (MSMEs). This application is designed to help MSMEs analyze sales data more efficiently through features such as sales summaries, best-selling cashier information, best-selling products, and less popular products. With the time filter feature and data visualization in graphs, MSME owners can easily monitor their business performance and make strategic decisions based on data.

The methodology used in this study is Design Science Research (DSR) with a development approach using Rapid Application Development (RAD). The application was tested using Black Box Testing, which showed that all features ran well, and the User Acceptance Test, which showed that 90.625% of users felt that this application was easy to use and suited to their needs.

Compared to previous solutions, the main advantage of this application is its ability to provide higher accessibility via mobile devices, allowing MSMEs to monitor their business performance anytime and anywhere. With this solution, MSMEs can be more empowered to face modern business challenges, increase operational efficiency, and make data-based decisions. And increase their competitiveness in the market.

As a further development, this study can be expanded by conducting a more in-depth evaluation of the impact of using the application in the long term and integrating artificial intelligence (AI) technology for predictive sales analysis. This predictive sales analysis will further increase the benefits of the application for MSMEs facing increasingly competitive market conditions.

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