

# Digitalization System Design for Monitoring and Control of Spare Parts Inventory Based on Android

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**Abstract**—This research was conducted at an automotive component manufacturing company. Production machines sometimes experience damage or abnormality, so they need repair. When repairing the engine, if a part is damaged, the part must be replaced. The machine cannot be used to produce the required spare parts are not available. Furthermore, we conducted research related to the digitalization design of the monitoring and controlling inventory stock spare parts maintenance system based on an android studio. This system is to overcome the absence of spare parts during breakdown maintenance and to support companies towards industry 4.0. This system will monitor the amount of spare part stock, record transactions that have been carried out, and reduce paper usage in inventory maintenance.

**Keywords**—digitalization system, spare parts inventory, monitoring and control systems, android studio

## I. INTRODUCTION

The production time for machines in the industry is 24 hours, so it is not uncommon for problems to occur on some machines and if there is a machine failure it can cause the production process line stop.

The Maintenance section is the part whose job is maintenance machines and repairs to the problematic machine. The Maintenance Section has a partshop which also functions as a Maintenance Part which is used to store machine parts and supporting parts for machines.

The process of ordering and procuring goods or equipment is still conventional, where if we are going to need goods or equipment it will take a long time, because it must go through a long process.

With conventional systems, available equipment is often uncontrolled, so that when a machine failure occurs, it cannot be repaired quickly.

To solve this problem, the Maintenance Department creates a procurement system for goods or components using mobile application that can be accessed by all users.

## II. THEORETICAL BACKGROUND

### A. Mobile Applications

A mobile application is a computer program designed for mobile devices such as cell phones, tablets or smart watches. In general, there are 3 types of mobile applications, namely web applications, native and hybrid.

### B. Mobile Operating System

A mobile operating system is known as a platform, software for mobile devices, a mobile operating system is a program that drives hardware such as cell phones, smart phones, tablets, and other information devices. There are various types of operating systems (OS) that are run by mobile devices, namely Apple iOS, Android OS, WindowsPhone OS, and so on.

### C. Android OS

Android OS is a mobile operating system developed by Google for use on touchscreen devices. This operating system was first developed by Android, Inc. The android operating system is open source, allowing the software to be modified freely. Generally, the android operating system is written in the Java programming language.

### D. Apple iOS

Apple iOS is Apple's mobile operating system developed and applied only to Apple Inc. devices, such as the iPhone, iPad, and Apple TV. The interface of iOS is based on the concept of direct manipulation via touch on the screen. The iOS operating system is closed source, making it impossible to develop and create a new operating system from iOS. It's also impossible to install apps outside of the Apple App Store.

### E. Android Application

Android applications are written in the Java and Kotlin programming languages. Android SDK (Software Development Kit) is software that can compile program code, data, and application resource files into an APK (android file package in the form of .apk). One APK file contains all android

application material and is the file used to install the application.

#### F. Database

Database is a collection of various data that are interrelated in such a way that it can be easily stored, manipulated and quickly when the user is called. The database is integrated and shared. Integrated means that the data in the database are interrelated. Split means that the same data can be used by several users at the same time [1,2].

### III. DESIGN AND TESTING

#### A. Application Development

The application to be created is named Maintenance Part System Application (MISA). The application will be used by all members of the maintenance department. The number of part stock, part name, part specification, part location code available in part maintenance will be stored in the MySQL database table as master.

The maintenance department can see the number of parts available, add new parts to the master, and update the number of parts stocks by reducing or adding parts that are already in the master. Maintenance personnel can also check the history

of using parts out. To find out more details about the application that the author made, it can be seen in the explanation of the application process flowchart.

Making the application will be divided into several stages, namely making the application process flowchart, mapping the application, creating a database, and implementing the program. Making process flowcharts is based on the process flow of taking spare parts, updating the number of spare parts, and the arrival of new spare parts.

This application process flowchart has only one activity, namely activity. Application mapping is used to find out what features are in the application. Making a database to store application data using a database to store application data using the MySQL database. Program implementation is the most important stage in making an application [3-11].

#### B. Flow Process Application

Fig.1. shows the flowchart of the application process.

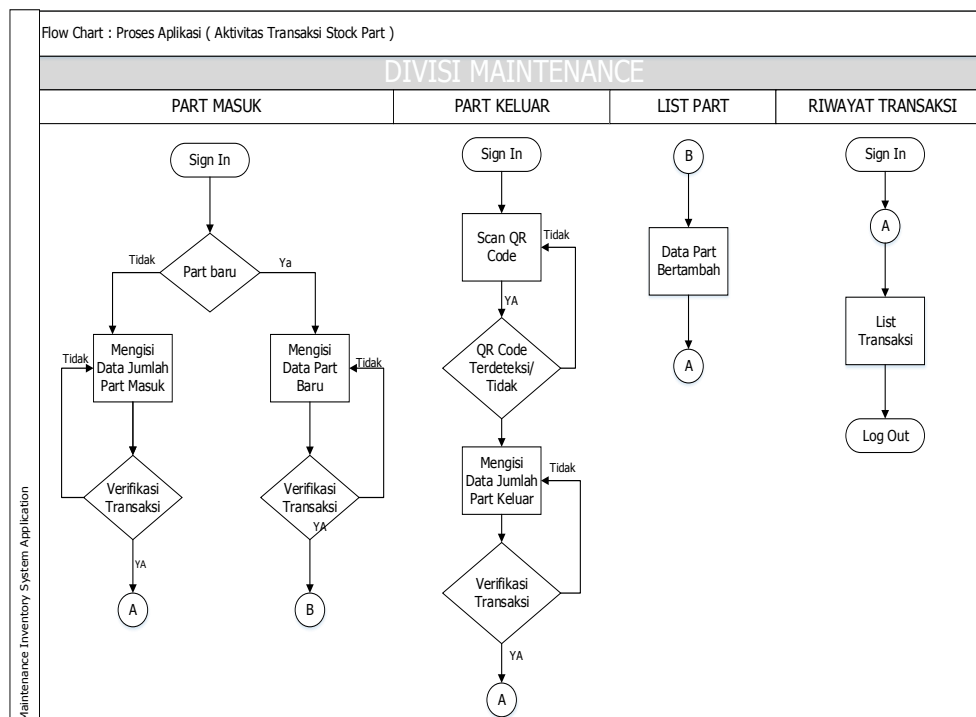


Fig. 1. The flowchart of the application process.

The flowchart of the application process above, the application users are all members of the maintenance department, and their activities are divided into two, namely

incoming and outgoing parts. Each member has access to spare part stock transactions. After members of the maintenance department enter the application and want to start a transaction,

members can choose to use part-in or part-out activities as needed.

Furthermore, after making a transaction, if there is a new part that is not in the database, it will enter the part list activity and add data to the master in the database. Each transaction in the application will be added to the historical data in the database in real time, the track record data or transaction history stored in the database will display the name of the member who is making a transaction so that it can be accounted for the transaction carried out. Fig.2. shows the flowchart of the application process (stock part of transaction).

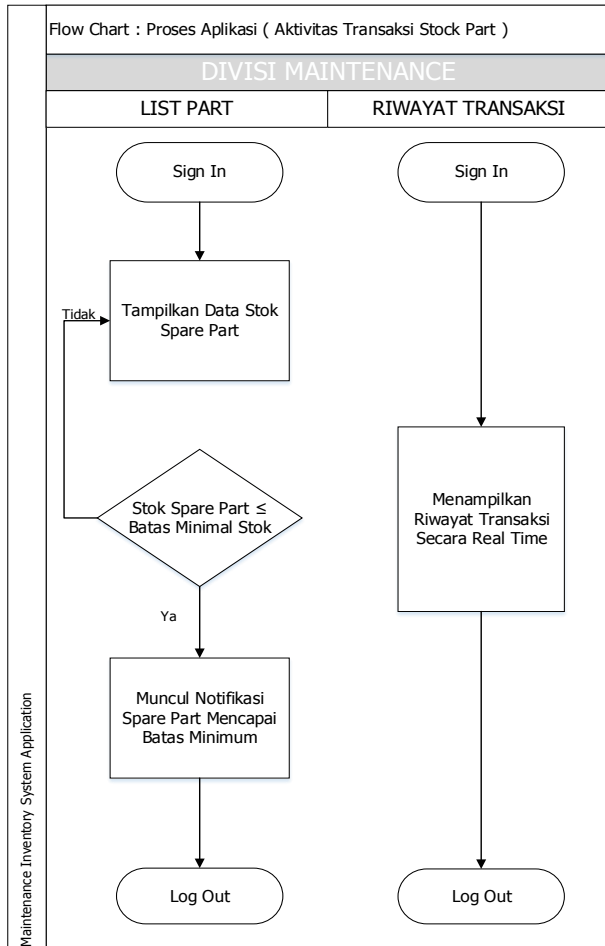


Fig. 2. The flowchart of the application process (stock part of transaction).

In the application process flowchart above, the user is a member of the maintenance department. All users have the same authority, namely being able to find out information about the number of spare part stocks, if the spare part stock has reached the minimum limit, all users will get a notification, so that maintenance members can immediately order spare parts. Users can also find out the history of transactions that have been made by other users by looking at historical activity.

### C. Application Database Delopment

Fig.3. shows the database structure.

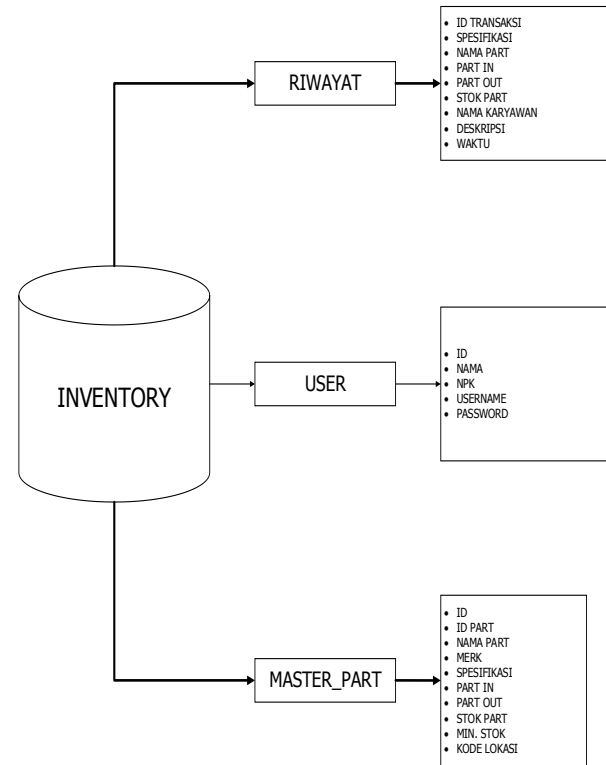


Fig. 3. The database structure.

In accordance with the design, the database used is the MySQL database. The database structure used can be seen in the image above. The “master” table functions to store data about the information of the spare part consisting of part name, brand, specification, part in, part out, part stock, minimum stock, and location code. The “history” table contains transaction data for incoming and outgoing parts consisting of part name, brand, specification, part in, part out, part stock, taker name, retrieval description and transaction time accompanying.

### D. Application Testing

Application testing is done to find out whether the application created can run properly or not. To be able to do this test, what the application needs is internet connection. Aspects of application testing are based on the repair plan, a list of requirements and requests that have been made previously.

### E. Analysis of Results

After testing, it was concluded that this application has met the required system criteria. With the following results:

- The Android-based maintenance inventory control system can function properly, can carry out transactions for incoming parts, new parts and outgoing parts using

the application, storing part data in the database and the order time is recorded automatically.

- Android-based part maintenance inventory monitoring system can function properly, can retrieve part data from the database and then display it on the part listview list and transaction history.

#### IV. RESULTS ANALYSIS

##### A. Problem Analysis

From the analysis of the existing conditions, we chose one of the causes of breakdown maintenance, namely the unavailability of the parts needed during repairs. The following is the author's analysis that causes parts not available. Table 1 shows the problem analysis.

TABLE I. PROBLEM ANALYSIS

| The Problem                                    | Cause  |
|--|--|
| Unavailability of parts at the time of repair. | Incorrect information on card stock and part book came out |
|  | No reminders for parts that are running low                |
|  | The history of using parts is not clear                    |

##### B. Improvement Plan

By analyzing the problems described in the table above, the authors plan to make improvements by creating systems that can overcome these problems. We also plan to support the development of companies to enter industry 4.0 by creating applications on smart phones.

The company has a demand that is needed in making applications. The following are requests from the company regarding the features of the application. Table 2 shows the list of requirements.

TABLE II. LIST OF REQUIREMENTS

| No | List of Company Requirements   |
|----|--|
| 1  | Application can be run on a smart phone  |
| 2  | The application is private and can only be accessed by registered users              |
| 3  | The log-in method uses a username and password                                       |
| 4  | Can store user information including name, title, NPK and email                      |
| 5  | Applications can monitor the number of parts available in part maintenance           |
| 6  | Applications can register new parts that enter part maintenance                      |
| 7  | Applications can update existing part data when there is entry into part maintenance |
| 8  | Applications can update part data that comes out when there is part taking           |
| 9  | Applications can display a history of entry and expenditure of parts                 |
| 10 | To identify parts, you must use a QR code scan                                       |
| 11 | All processes in the application must be recorded in real-time                       |

Based on the table above, the writer adjusts the requests and needs as well as the improvement plans that the author has

made into several features in an application. Here are 5 main features that will be provided in the application:

- Monitoring part in the form of an online list (List Part)
- This feature provides part information about part id, part name, specification, current stock quantity, and location code.
- Part taking transaction (Part Out)
- This feature functions like a form where users who want to retrieve goods can scan the QR code for the part to identify the part they want to take, then the user can enter the number of parts taken, the name of the taker, and a description of use.
- Transactions for the entry of new parts and existing parts (Part In)
- This feature functions like a form where users who want to add an existing part scan to identify the part, enter the number of parts they want to add, then for new parts it is necessary to register and fill in the part id, part name, specifications, stock amount, and location code.
- Information history of entry and expenditure part (History)
- This feature will display part transaction history in the form of part list in real-time
- There is a notification that reminds part that is running low

This feature will notify all users that there are parts that are close to the minimum stock level so that they can place orders before the parts run out.

##### C. Determining the Type of Application

Improvements that will be planned are made by creating an inventory management system application that can be run on mobile devices such as mobile phones (smartphones). There are 3 types of mobile applications that can be run on smart phones, namely web applications, native applications, and hybrid applications. Determination of the type of mobile application to be made based on several specifications.

#### V. CONCLUSION

In this paper, we have discussed about design and making a digitalization system for monitoring and controlling the inventory of maintenance spare parts using an android application. All maintenance personnel can find out the amount of spare parts inventory in the maintenance inventory by looking at the parts list on the Android application. All maintenance personnel can find out if a spare part is running low with the appearance of a part notification reaching the minimum limit on the Android application. Transaction processes for outgoing parts, incoming parts, and new parts can be monitored in the listview of transaction history in the

application so that it is clear who the parts that go in and out are used by and for what.

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