

The development of the Synchronized Point of Sale Applications with e-Marketplace Using Ruby Framework on Rails

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Received: 11.03.2020 Revised: 12.04.2020 Accepted: 28.05.2020

Abstract— The purpose of applied research is to create a web-based Point of Sale application to help MSME business processes. The app that can help note-taking report generation automatically and will provide authorization and approve data with the E-Marketplace. The application is built with the Ruby on Rails framework and uses Progressive Web App technology to access pages without the internet. The application development method used is the waterfall method, which consists of communication, planning, modeling, construction, and dissemination. In the discussion, data collection is done through literature study, observation, and interviews of several MSME businesses; then the data are analyzed to be a list of application needs. In planning, an estimated schedule is made for application work based on a list of application requirements. The system structure design and application appearance are carried out in wave modeling, with UML diagrams for application systems and ERD diagrams for database structures. Work on the application is carried out on the construction test and application testing with the black box method. After the application passes the trial run, continue to deploy, i.e., direct interviews with several MSME businesses about apps that have been made to get feedback and suggestions. The results of this study are web-based POS applications that are connected to the E-Marketplace that can help MSME business processes. The application can be accessed with a web browser, with the feature of making transactions that can be accessed without relying on an internet connection. The conclusion of this research is the application that can help digital recording, make relevant reports automatically, easily accessible, can make transactions without an internet connection, and help regulate data consistency with the E-Marketplace.

Index Terms— E-Marketplace, Point of Sale, Progressive Web App, UMKM.

I. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) have a strategic role in improving the Indonesian economy. The rapid development of MSMEs can increase people's income, but many MSMEs fail to develop. It is due to no systematic bookkeeping, small capital, and limited access to technology. Thus, MSME owners are too focused on technical matters such as recording and reporting manually. Based on these MSME constraints, an online computerized purchasing service system was born, the Point of Sale (POS). But over time, many MSME businesses have also used the E-Marketplace as one of the primary means of selling. Based on the results of interviews, there are several MSMEs have problems in adjusting product stock between physical stores and stores in the E-Marketplace. Therefore, the primary purpose of this application is to make POS applications. They are easily accessible, help MSME business processes, record and produce relevant reports, and support synchronization of data with E-Marketplace automatically.

II. RESEARCH METHOD

Application development using the waterfall method. According to Pressman & Maxim (2015), the waterfall method is an integrated and sequential development method, which consists of communication, planning, modeling, construction, and dissemination.

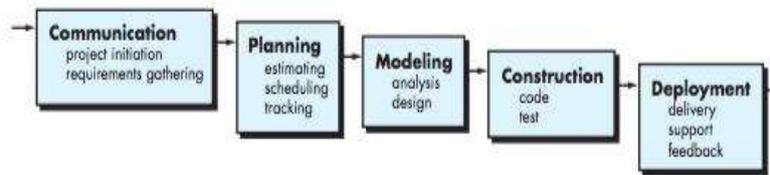


Fig. 1. The Waterfall Method

In the **communication** stage, data collection is carried out for application needs through a literature study of several similar research and publications, interviews of several MSME businesses and observations of some MSME businesses and related POS applications that are already running.

According to interviews with several MSME businesses, several problems were found in the running system process as follows:

1. Recording manually can cause errors or damage
2. It takes a lot of time to manually move transaction records
3. Not trying the cash register because of the large fee
4. No clear inventory or inter-branch stocks
5. Synchronizing stock between various media is complicated and time-consuming.

Based on the results of the interview, the system that runs on business processes that run in various places of business, in general, are as follows:

1. Before adding product stock, check the condition or share of the product in the warehouse, then order the product to the supplier.
2. Goods received from suppliers will be recorded, then stock report data will be changed.
3. Buyers come to the store and make purchases. The goods purchased will be recorded by clerk or cashier

at the location on the sale transaction, then buyer will be given proof of transaction.

4. The manager or owner will collect transaction data and then count and transfer it to other media such as Microsoft Excel and then stored online.

5. To view reports, transaction records will be searched first and calculated as needed.

Nowadays, there are many solutions offered by point of sale systems with various types of systems developed in the form of applications or the web, such as Moka POS, HelloBill, Olsera, PHP POS, and OpenBravo POS. The following is a summary list of features comparison of POS applications:

Table I. Summary List of Features Comparison of POS Applications

| | Moka POS | HelloBill | Olsera | PHP POS | OpenBravo POS |
|-------------------------------|----------|-----------|--------|---------|---------------|
| Digital cash register | Y | Y | Y | Y | Y |
| Cloud Based Data | Y | Y | Y | Y | Y |
| Stock Management | Y | Y | Y | Y | Y |
| Multi Outlet | Y | Y | Y | Y | Y |
| Automatic Reporting | Y | Y | Y | Y | Y |
| Proof of Digital Transactions | Y | Y | Y | Y | Y |
| POS on Android mobile | Y | Y | Y | Y | Y |
| POS on iOS mobile | Y | Y | Y | Y | Y |
| POS on web browser | - | - | - | Y | - |
| POS offline | Y | Y | Y | - | Y |

The following table compares prices for using the POS application every month:

Table II. Price Comparison using POS Application

| No | Company Name | Product Name and Type | Price |
|----|-----------------------------|---|-------------------|
| 1. | PT Moka Teknologi Indonesia | MokaPOS (<i>Mobile POS</i>) | Rp. 299.000/month |
| 2. | HelloBill | HelloBill (<i>Mobile POS1</i>) | Rp. 150.000/month |
| 3. | PT Olsera Indonesia Pratama | Olsera (<i>Mobile POS</i>) | Rp. 125.000/month |
| 4. | PHP Point of Sale, LLC | PHP POS (<i>Multi Device POS</i>) | Rp. 398.000/month |
| 5. | OpenBravo S.L.U | OpenBravo POS (<i>Multi Device POS</i>) | Rp. 44.000/month |

Based on the results of the analysis of similar applications and direct interviews with several MSME businesses, several problems that must be resolved are obtained, including:

1. Manual report recording

2. There is an opportunity for fraud or errors in the transaction process
3. It costs a lot to use an online cash register
4. Repeat checking of stocks if using an online store
5. Connection dependency to use the online POS system

Based on the identified problems, several solutions are proposed to solve these problems, including:

1. Designing a system that can make transaction reports accessible online based on the results of transactions made at the store.
2. Design a system that can record transactions to reduce the level of fraud or errors.
3. Design a cash register that has general features to support various types and methods that can be used on multiple platforms so that users do not need to spend a lot of money to use an online cash register machine.
4. Design a system that has features that complement the stock provided in the application with the E-marketplace so that users can have data that supports various media selling.
5. Design a system that does transactions offline so the users can still make transactions without any dependence on the internet connection. Data will be automatically saved in the order if you have an internet connection.

The following is a list of features planned for the application:

1. POS Cashier

Features to make transactions through the digital cashier menu, to select products, additional fees, and transaction details. Sales made will be saved automatically and will show proof of transactions digitally.

2. Store & Employees Management

Features for adding stores and managing additional store information, including a list of employees per store. Users with owner roles can create more than one store.

3. Additional Cost Management

The features to manage additional costs, such as discounts or taxes. Other fees can be used on the product or added during transactions according to user requirements.

4. Product Management

Product management features, adding new products, or changing product data as needed.

5. In Stock

Feature to make note of changes in stock registered in the application with shares in the warehouse. Recorded data that has been created cannot be deleted or changed.

6. Transaction List and Details Page

Users can see a list of transactions by store and date of the transaction period. Users can view transaction details and take actions such as refunding transaction fees, canceling transactions that have been partially paid, resending proof of purchase to the buyer's email, or view transaction activity.

7. Dashboard Menu

The dashboard displays briefly relevant information that occurred that day according to the selected store. Data is displayed in the form of total products sold, total sales, total transactions carried out, list of products sold, and list of products that are close to the minimum inventory limit.

8. Transaction Report

Feature to see the number of transactions, transaction data such as gross sales, net sales, and transaction reduction data such as taxes and surcharges according to the store choice and the date that will be calculated automatically by the application.

9. Employee Performance Report

The feature to view transactions made by all users in the selected store, and count the number of purchases made based on transaction status.

10. Offline Features

Application with Progressive Web Application technology enables accessibility of POS pages without relying on the internet. Transactions made without a connection will be stored in the browser and will remain up to the internet connection to store purchases on the application server.

11. Synchronization Feature with E-Marketplace

Application features to connect to the E-Marketplace to get product and stock data recorded in third parties and recorded in the application, then users can choose to manage data between third parties and applications so that the data between the media becomes appropriate. This feature also ensures that transactions on the E-Marketplace will send product data that has been linked in the application and take stock-taking to record stock movements.

The data collected is analyzed into a list of application needs that are used at the planning stage to determine and schedule the estimated application work as follows:

Table III. Schedule of Planning

| Date | Activity |
|-------------------------|---|
| 08/03/2018 - 14/03/2018 | Collection of application requirements |
| 14/03/2018 - 28/03/2018 | Making UML diagrams according to application requirements |
| 28/03/2018 - 11/04/2018 | Making an ERD diagram according to application requirements |
| 11/04/2018 - 18/04/2018 | Making a rough design of the application display |
| 18/04/2018 - 18/06/2018 | Application making |
| 18/06/2018 - 25/06/2018 | Perform black-box testing on the application |
| 25/06/2018 - 03/07-2018 | Final interview with the application for feedback |
| 03/07/2018 - 04/07/2018 | Analysis of the results of the final interview |

The system design and application appearance are carried out at the **modeling** stage, with Unified Modeling Language (UML) diagrams to illustrate the needs and application systems and Entity Relationship Diagrams (ERD) diagrams to illustrate the structure of the database.

The system requirements design is illustrated in the use case diagram as follows:

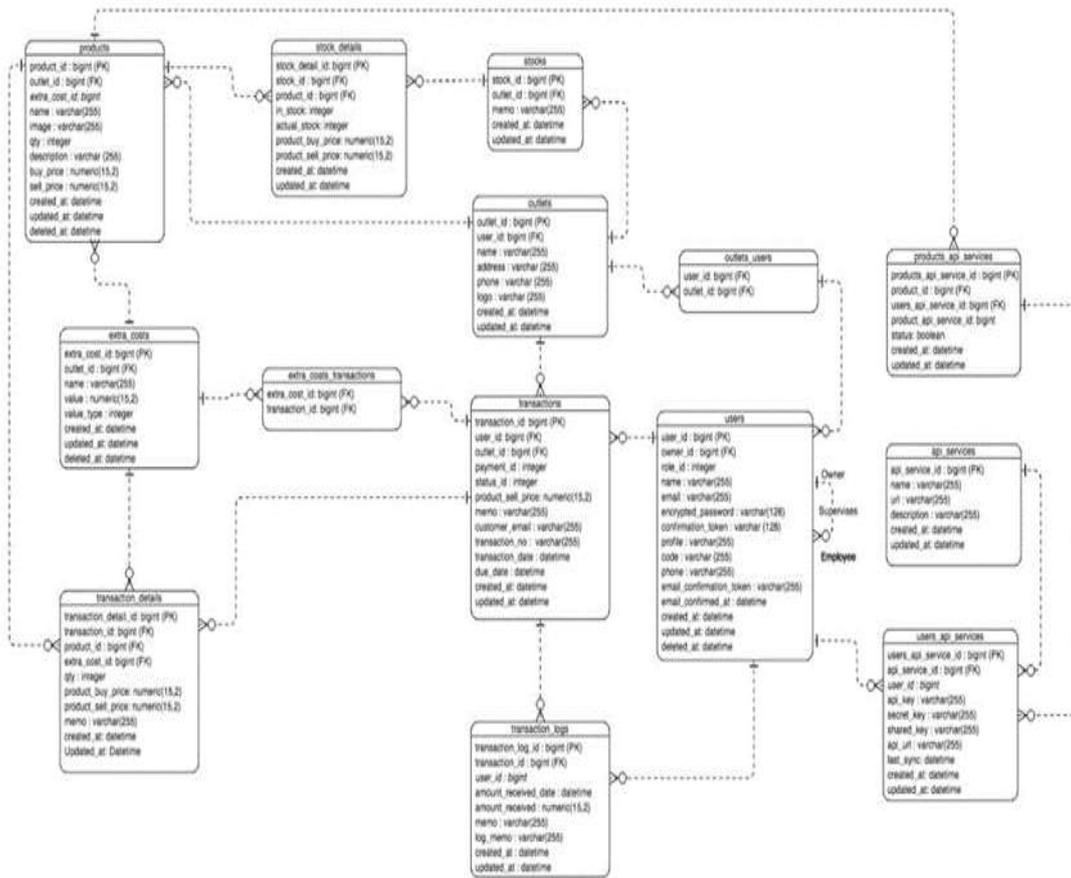


Fig. 3. Entity Relationship Diagram

The design of the relationships between objects in the application system is illustrated with class diagrams as follows:

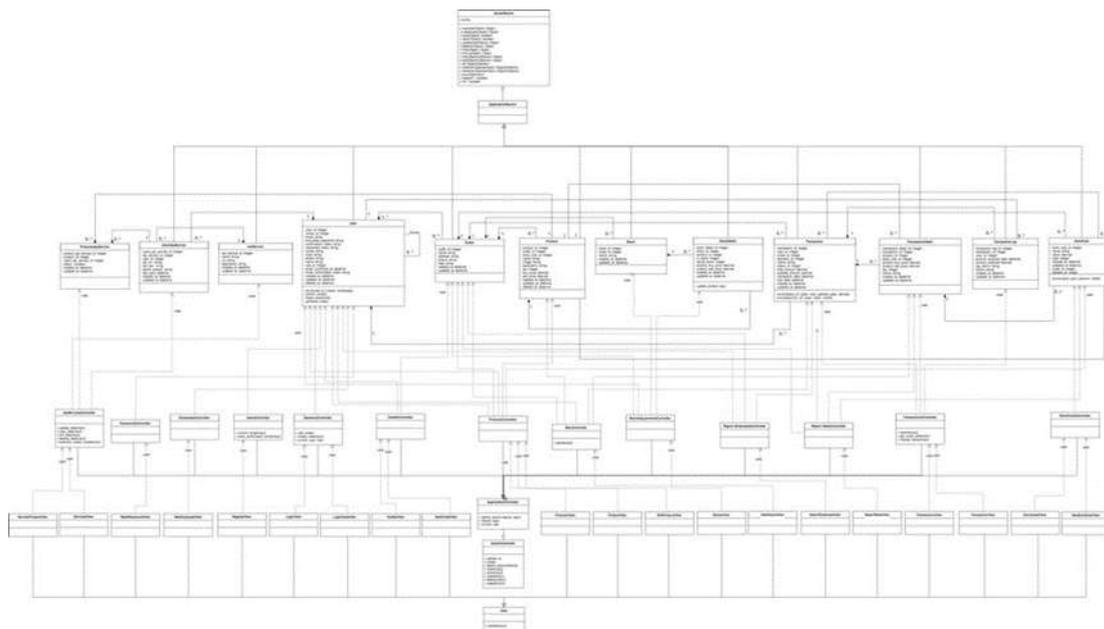
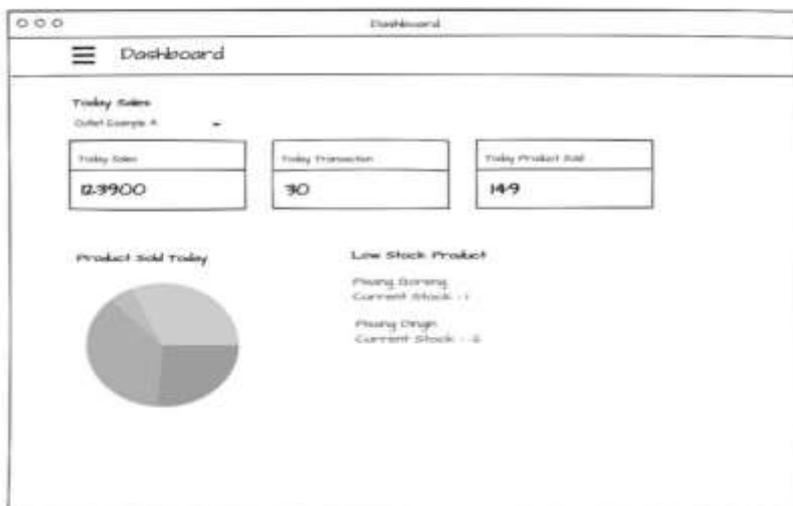


Fig. 4. The Relationship between Objects and Class

Here are some application design views:



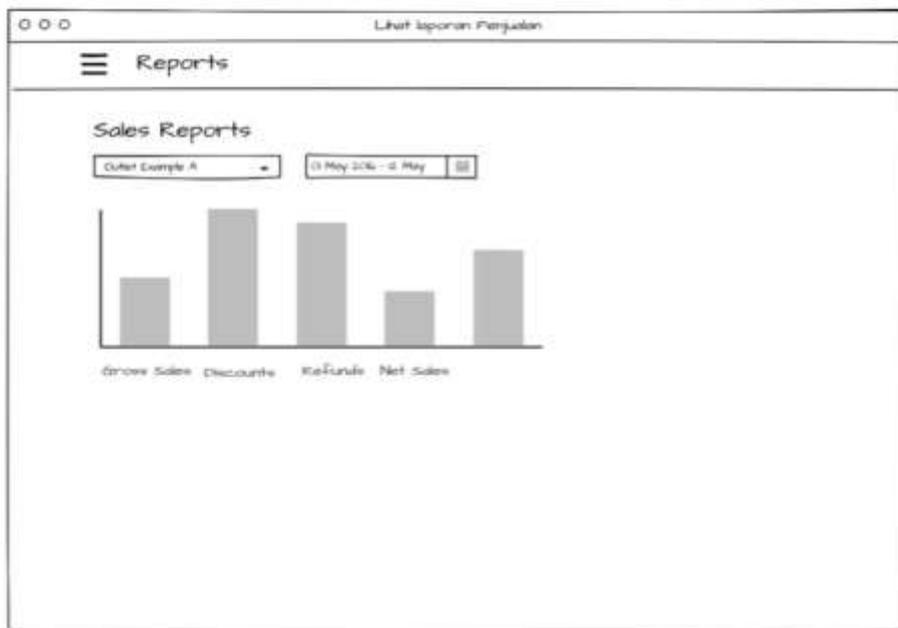
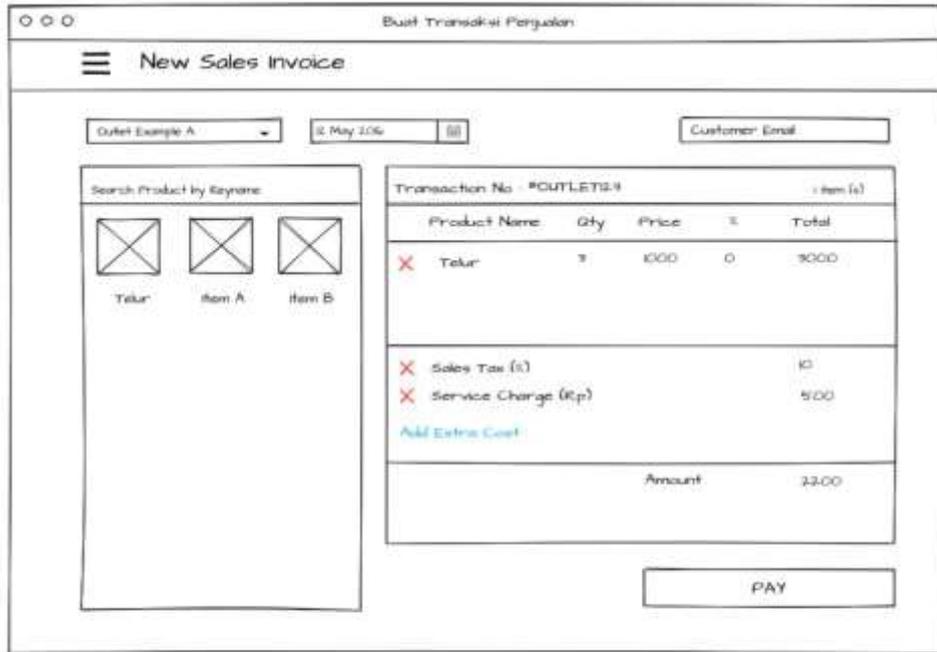


Fig. 5-10. The Application Design Views

At the construction, the stage begins with the application work based on system design and needs that have been made. Applications that have been made will be tested internally with black-box testing.

When the application has been tested, development continues with the deployment phase. At the deployment stage, interviews are conducted directly with several MSME businesses regarding applications that have been made. The results of the discussion will be collected into feedback and suggestions for application conclusions.

III. RESULT AND DISCUSSION

The Point of Sale application is based on a website that has been hosted using the Heroku service, so users only need a web browser and internet connection to access all features. The minimum specification for utilizing an application is a web browser such as Chrome with a minimum version of 40 or a minimum version of Firefox 44.

Testing is done to test every application feature and find errors in the application where one of the results is shown in the following table:

Table IV. Testing Results

| No. | Features | Scenario | Expectation | Test Result |
|-----|----------------|---|---|---------------------------|
| 1. | Owner Login | Log in by filling in the wrong Email and Password data | Refuse login access and display a message failed. | According to expectations |
| 2. | Owner Login | Log in by filling in the correct Email and Password data. | Enter the main page of the application. | According to expectations |
| 3. | Employee Login | Log in with the wrong access code. | Refuse login access and display a message failed. | According to expectations |
| 4. | Employee Login | Login with the correct access code | Enter the main page of the application | According to expectations |
| 5. | Sign Up | Sign Up with the wrong email and password data | Decline incoming access and display a message failed. | According to expectations |

| | | | | |
|----|-----------------|---|--|---------------------------|
| 6. | Sign Up | Register with email data that has not been sent and the password correctly. | Users will receive a new account confirmation email. | According to expectations |
| 7. | Forget Password | Reset Password by filling in the email that has been registered | Refuse login access and display a message failed. | According to expectations |
| 8. | Forget Password | Reset Password by filling in an email that has not been registered | Receive an email to reset the password. | According to expectations |
| 9. | Logout | Logging out | Can exit the application | According to expectations |

To get information about the application's user interface, use the Shneiderman's Eight Golden Rules of Interface Design guide. The following evaluation results use the guide:

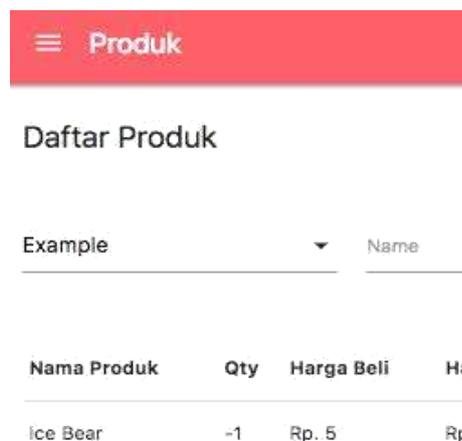


Fig 11: Guide for Evaluation Results

1. Try to be consistent
2. Provides general functions

3. Provide informative feedback
4. Design dialogue as closure
5. Prevents mistakes
6. Allow reversal of action
7. Support internal locus control
8. Reducing the burden of short-term memory

Evaluation of 5 measurable human factors and application systems is carried out by giving a number of questions to a number of MSME resource persons. The following is the summary of interviews:

1. POS feature can help the business process of the interviewees
2. The feature of recording transactions and making reports automatically can save time and effort
3. The offline transaction creation feature can help users make transactions smoothly without internet dependency.
4. The dashboard feature already provides enough and relevant information
5. Features connected to the E-Marketplace can help users who also conduct business in the E-Marketplace, especially in the stock section.
6. The average resource person was satisfied and comfortable to remember using the application.

IV. CONCLUSION AND RECOMMENDATION

The conclusion obtained from the results of testing, evaluation and interviews that have been carried out are:

1. This website application can support users in business processes as POS applicants.
2. The website application can reduce the time needed to record and report.
3. This website application can be accessed through a web browser with an internet connection, and the transaction creation feature can be used without internet dependency
4. This website application can help provide inventory conditions that are synchronized with the E-Marketplace.

Based on the evaluation results and conclusions, some suggestions can be obtained as follows:

1. Add salary information to employee details to display on the sales report.
2. Add E-Marketplace options.
3. Add a notification feature for products with stocks that are close to the minimum stock limit.

V. REFERENCES

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