Business Information System for Workshop Using Rapid Application Development Method

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Abstrak

Perkembangan teknologi informasi mendorong digitalisasi di berbagai sektor, termasuk industri perbengkelan. Digitalisasi dapat meningkatkan efisiensi, akurasi pencatatan, dan kecepatan layanan. Namun, banyak bengkel kecil hingga menengah masih menggunakan sistem manual, seperti Bengkel Betawi Motor Service (BMS) di Jatiasih yang mencatat transaksi, stok, dan laporan keuangan secara terpisah menggunakan Microsoft Excel. Cara ini menimbulkan masalah seperti kesalahan input, duplikasi data, sulitnya memantau stok secara real-time, serta laporan keuangan yang kurang akurat. Untuk mengatasi kendala tersebut, penelitian ini bertujuan merancang dan membangun sistem informasi bisnis berbasis website menggunakan metode Rapid Application Development (RAD). Metode RAD dipilih karena mendukung pengembangan cepat dan iteratif melalui tahap perencanaan kebutuhan, desain, pengembangan, dan implementasi. Sistem yang dibangun memiliki tiga jenis pengguna admin, manajer, dan karyawan dengan hak akses berbeda. Hasil Black Box Testing dan User Acceptance Testing menunjukkan seluruh fitur berjalan baik. Sistem ini dapat diakses melalui https://bengkelbms.zya.me dan membantu digitalisasi operasional Bengkel BMS.

Kata kunci: *Black Box, Rapid Application Development, Sistem Informasi Bisnis, Website*

Abstract

The development of information technology is driving digitalization in various sectors, including the repair shop industry. Digitalization can improve efficiency, record-keeping accuracy, and service speed. However, many small to medium-sized repair shops still use manual systems, such as the Betawi Motor Service (BMS) workshop in Jatiasih, which records transactions, stock, and financial reports separately using Microsoft Excel. This method causes problems such as input errors, data duplication, difficulty monitoring stock in real time, and inaccurate financial reports. To overcome these obstacles, this study aims to design and build a website-based business information system using the Rapid Application Development (RAD) method. The RAD method was chosen because it supports rapid and iterative development through the stages of requirements planning, design, development, and implementation. The system has three types of users: admin, manager, and employee, with different access rights. The results of Black Box Testing and User Acceptance Testing indicate that all features function well. This system can be accessed through https://bengkelbms.zya.me and helps digitize the BMS Workshop's operations.

Keywords : *Black Box, Business Information System, Rapid Application Development, Website*

1. Introduction

The development of information technology has driven the digitalization process in various sectors, including the repair shop industry. Digitization can increase efficiency, reduce recording errors, and accelerate service delivery. However, many small to medium-sized repair shops still use manual or semi-manual systems, such as the Betawi Motor Service (BMS) workshop in Jatiasih, which records transactions, inventory, and financial reports separately using Microsoft Excel [1]. This system causes obstacles such as data duplication, input errors,

and inaccurate financial reports. Furthermore, administrative processes that are not integrated and digitized can slow down customer service and make it difficult for repair shop owners to analyze business developments.

Several previous studies have explored similar solutions using a web-based repair shop information system approach. Nurlaila and Mulyono designed a web-based repair shop management system, but only developed a prototype [2]. Another study by Maulana et al. developed an application-based service booking system that did not fully cover financial management aspects [3]. Meanwhile, Sigalingging et al. designed a web-based repair shop information system to support reservations, data management, and reporting, but did not evaluate the user experience in depth [4].

Given these issues, a website-based business information system is needed that can automate data recording, simplify inventory management, and increase efficiency in the service process. A Business Information System (BIS) is a formal system within an organization that combines social and technical aspects to support data management. The primary goal of implementing a BIS is to improve the quality of decision-making, strengthen coordination between departments, and optimize managerial control [5]. With an integrated system, workshops can optimize their operations, provide faster and more accurate service, and increase customer satisfaction. A website-based system also facilitates access to information from multiple locations, allows owners to monitor workshop progress even when away from home, and provides the data necessary for better business decision-making [6].

The Rapid Application Development (RAD) method was chosen because it accelerates the system development process through prototype iterations, direct end-user involvement, and a focus on speed of implementation [7]. This method aligns with the needs of BMS Workshops, which require fast and responsive digital solutions.

Based on the above description, this paper will be entitled "Designing a Business Information System in a Workshop Using the Rapid Application Development Method." It is hoped that this website-based business information system for workshops can improve operational efficiency, simplify workshop activity recording, optimize spare parts stock management, and support digitalization and faster and more accurate business decision-making at BMS Workshops.

2. Research Method

This research used the Rapid Application Development (RAD) method, which emphasizes an iterative and rapid system development process through prototyping. RAD is a sequential and linear software development process model, focusing on very short development cycles tailored to the needs of the application being designed or developed. This method consists of four main stages: Requirements Planning, System Design, Development, and Implementation [8].

In the Requirements Planning stage, data was collected through observation and interviews to identify the system's functional and non-functional requirements. The System Design stage was carried out iteratively using a prototype approach, including the design of the Business Process Model and Notation (BPMN), class diagrams, database, navigation structure, and user interface. BPMN is a standard in business process modeling that provides a graphical notation for depicting workflows in business process diagrams [9]. The designed prototype was then tested directly by the Bengkel BMS owner and refined based on feedback until it was approved.

The Development stage included the implementation of the system according to the design using PHP and MySQL, including the integration of key functionalities. Finally, the Implementation stage is carried out by hosting the system to the server, testing using the Black Box Testing method, and User Acceptance Testing (UAT) with the workshop owner. Black Box is used to identify weaknesses or deficiencies in the application [10]. UAT is a testing process carried out by end users with the aim of proving whether the developed system is acceptable or not. If the test results show that the system has met user needs, then the application is declared suitable for implementation [11]. In addition, short training is also provided so that the system can be used optimally in workshop operations. The Research Method Flow can be seen in Figure 1.

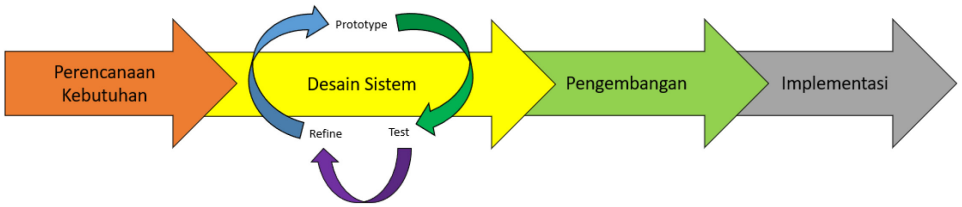

Figure 1. Research Stages

3. Literature Study

The first study, conducted by Rokhaila, Kurniawati, and Agusten in 2024 in the Applied Technology journal, entitled "Web-Based Payroll System for Fashion Boutiques: Implementation of the RAD Method," discussed a website-based payroll system as an effective solution to existing problems using the Rapid Application Development (RAD) method due to its ability to respond quickly to business changes. The results showed that this system can optimize operational efficiency by automating the payroll process while reducing the risk of errors in payroll calculations. However, this study also has several weaknesses. The system developed does not provide a data filtering feature based on month or date, making it difficult for users to search for payroll or absence history for a specific period. Furthermore, the system does not provide graphical or data visualization features such as graphs of absences, tardiness, or salary summaries, which are essential to support managerial analysis and decision-making [12].

A second study conducted by Audrilia and Budiman, in 2020, published in the Madani journal, entitled "Design of a Web-Based Workshop Management Information System (Case Study: Anugrah Workshop)," described the development of a web-based workshop management information system that makes it easier for customers to obtain information about spare parts availability and service data. This research used the Web Engineering system development method. The resulting system is capable of generating reports automatically based on data stored in the database, which is expected to help workshop owners monitor sales reports more easily. However, a weakness of this system is the lack of an automatic mechanic salary management feature, so mechanic fees or incentive calculations must still be done manually outside the system. Furthermore, the system does not provide automatic notifications when spare part stocks are running low, which could potentially cause delays in procurement and impact the workshop's service to customers. Web Engineering methods also tend to place the user feedback process at the final stage of development, so if problems or inconsistencies are discovered, fixing them requires additional time and cost because changes must be made to a system that is already nearly complete. [13].

4. Result and Discussion

This section presents the results of the information system development and discusses the implementation process using the Rapid Application Development (RAD) method. The RAD stages are explained as follows.

4.1. Results of the Requirements Planning Stage

Based on the needs identification results, this system was designed to assist in automatic transaction recording, real-time spare parts inventory management, financial reporting (gross and net profit), and facilitate remote operational monitoring by workshop owners.

System features are tailored to user roles. Employees can record service and spare parts purchases, print digital receipts, and view transaction history. Managers record expenses, manage inventory, monitor accounts receivable and payable, and update sales status. Admins are responsible for managing user accounts, adding cash advances, and exporting reports in PDF/Excel format.

The system also meets non-functional requirements, such as security (login and access restrictions), availability (access during operating hours), performance (response within 5

seconds), ease of use (simple interface), portability (compatible across devices), and maintainability (modular and documented code).

4.2. Results of the System Design Phase

The results of the system design phase yielded five main components to illustrate the structure and workflow of the website-based business information system at BMS Workshop. These components include BPMN, class diagrams, database table design, navigation structure, and user interface. These elements represent the visual and functional representation of the system and the interaction between users and the system. The following are the results of the system design phase:

1. BPMN Admin
   The BPMN diagram illustrates the business flow from the admin's perspective, from login to logout. After successfully logging in, the admin can access features such as user management, cash advance manager, transaction history, sales and expense reports, and profile settings. This diagram helps visualize the admin's roles, authorities, and interactions within the system. An illustration of the complete BPMN admin flow is shown in Figure 2.

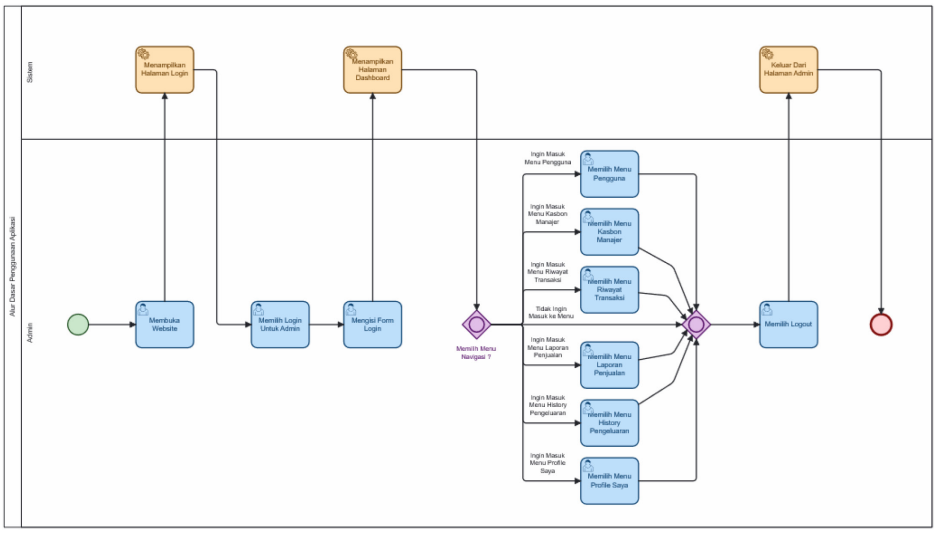

Figure 2. BPMN Admin

2. BPMN Manager
   The manager's BPMN diagram illustrates the manager's activity flow in using the system, from login to logout. After successfully logging in, the manager is directed to the dashboard, which serves as a control center for accessing features such as expense reports, products, categories, accounts payable and receivable, and scrap metal/oil sales. Each activity reflects the manager's control and oversight function over the data and operations recorded by themselves and their employees. The complete manager's BPMN diagram is shown in Figure 3.

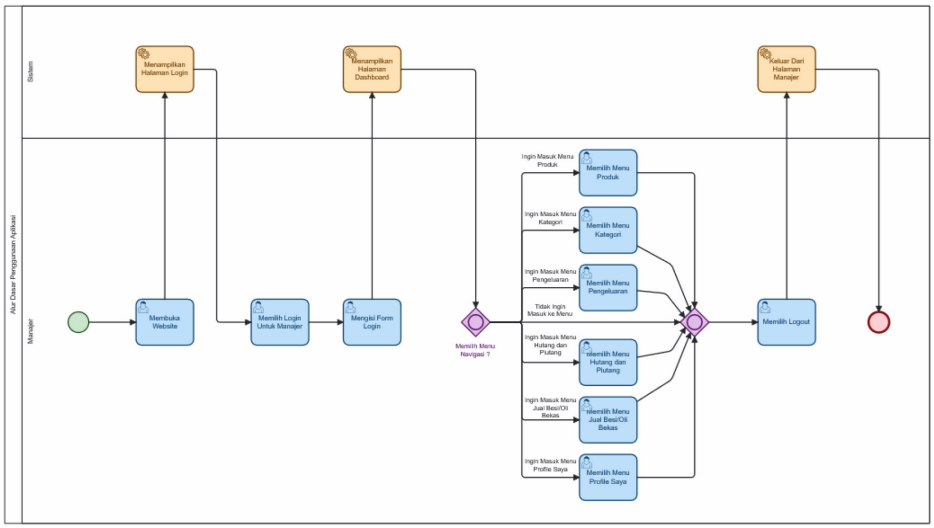

Figure 3. BPMN Manager

3. BPMN Employee

The employee BPMN diagram illustrates the cashier workflow within the system, from login to logout. After logging in, employees can record sales through the Transaction Input menu, review history in the Transaction List, and manage their accounts through My Profile. The system also provides a receipt printing feature as proof of transactions. This flow demonstrates the employee's role in supporting sales operations and data recording. The complete employee BPMN diagram is shown in Figure 4.

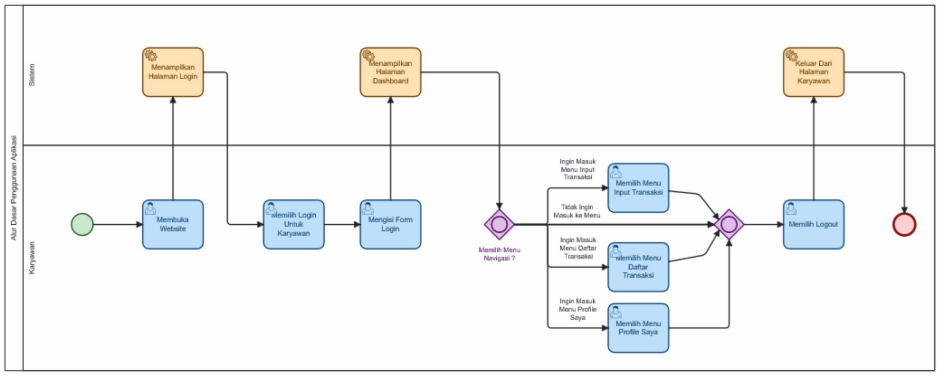

Figure 4. BPMN Employee

4. Class Diagram

A class diagram is a collection of various classes and the relationships that connect them. A class is usually depicted as a rectangle, where the topmost section contains the class name, followed by attributes in the middle, and the methods owned by the class at the bottom [14]. The Bengkel BMS system class diagram depicts the relationships between entities such as products, categories, transactions, users, and expenses. This system manages inventory, sales, receivables, cash advances for managers, and sales of used goods. There are three main user roles: admin, manager, and employee, each with specific login and role attributes. The complete class diagram is shown in Figure 5.

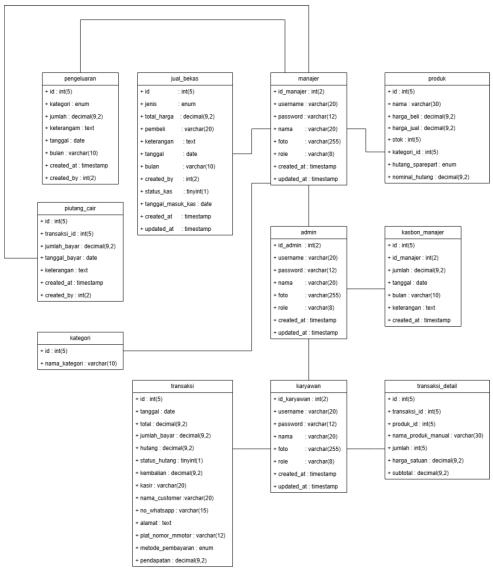

Figure 5. Class Diagram

5. Admin Navigation Structure Design

The navigation structure provides an overview of the website's content and explains the relationships between its sections. This structure allows for a comprehensive overview of the website's information structure, making it easier for users to access the content they need efficiently [15]. The admin navigation structure is designed in a linear and hierarchical manner to simplify system access and management. After logging in, the admin is directed to the dashboard with access to the main menus such as Users, Cash Advance Manager, Transaction History, Sales Reports, Expense History, My Profile, and Logout. Each menu has specific functions such as data management, viewing history, and exporting reports in PDF/Excel format. The design of the admin navigation structure can be seen in Figure 6.

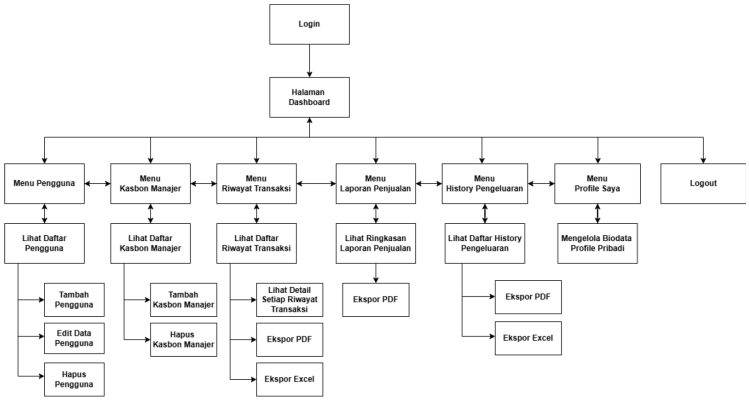

Figure 6. Admin Navigation Structure

6. Manager Navigation Structure Design

The manager's navigation structure is designed with a linear and hierarchical approach to facilitate access to product, transaction, and financial-related features. After logging in, managers enter a dashboard that provides main menus such as Products, Categories, Expenses, Payables and Receivables, Selling Used Iron/Oil, My Profile, and Logout. Each menu has data management functions, such as adding, editing, deleting, and exporting data to PDF/Excel, thus supporting smooth operations and financial recording. The manager's navigation structure design can be seen in Figure 7.

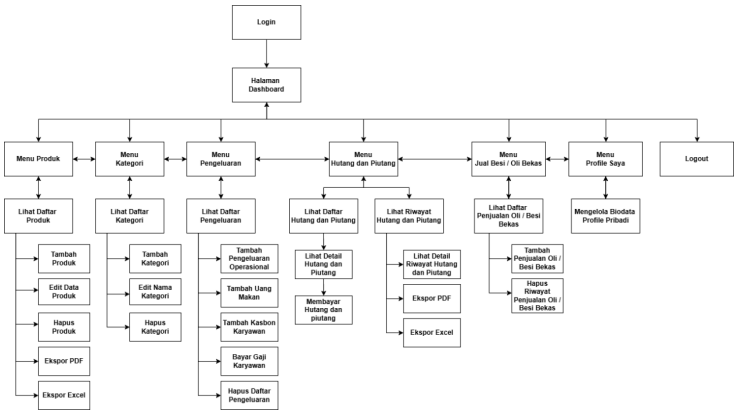

Figure 7. Manager Navigation Structure

7. Employee Navigation Structure Design

The employee navigation structure is designed with a linear and hierarchical approach to facilitate the operation of the cashier system. After logging in, employees are directed to the dashboard with access to main menus such as Transaction Input, Transaction List, My Profile, and Logout. These menus allow employees to record transactions, view history, manage personal data, and exit the system safely and efficiently. The employee navigation structure design can be seen in Figure 8.

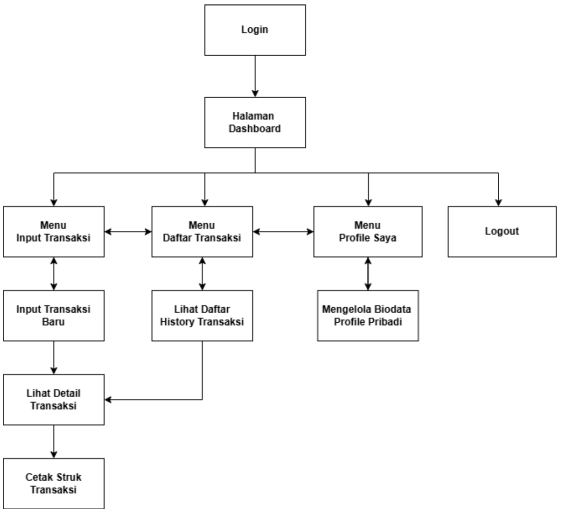

Figure 8. Employee Navigation Structure

8. System Display Design

The system interface is designed to provide an intuitive interface and is tailored to the user roles, namely Admin, Manager, and Employee. Each interface is tailored to its own access rights and functionality to make the system more efficient and easy to use. Before logging in, users are greeted with a home page displaying the title “Welcome to BMS Workshop” with a workshop photo in the background, as well as three login buttons to select roles, each equipped with an icon, access description, and a login button. The System Interface Design can be seen in Figure 9.

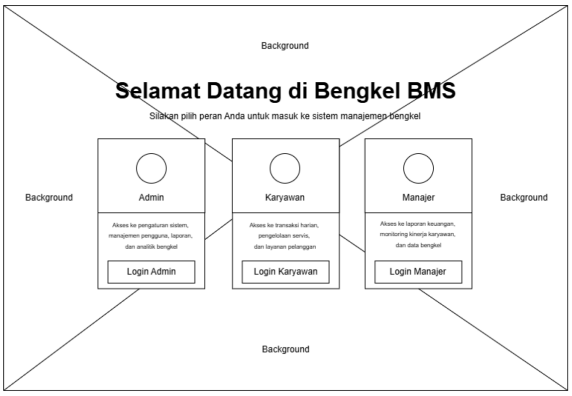

Figure 9. System Display Design

9. Admin Dashboard Page Design

The admin dashboard page is the main interface after logging in. It displays a sidebar on the left containing a profile photo, account name, and navigation menus such as Users, Cash Advance Manager, Transaction History, Sales Reports, and Expense History. At the top is a header with the title, admin name, and Profile and Logout buttons. The main content displays a statistical summary such as total employees, total sales, a 7-day revenue graph, and system usage tips. The admin dashboard page layout can be seen in Figure 10.

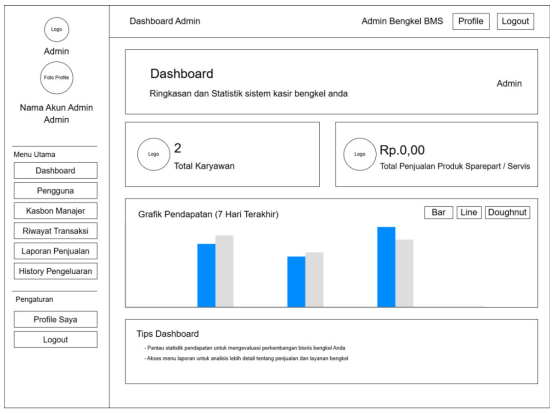

Figure 10. Admin Dashboard Page Design

10. Manager Dashboard Page Design

The manager dashboard page displays the main interface for managing workshop data, with a sidebar containing a profile photo, account name, and the main menu and settings. The header contains the manager's title and identity, complete with Profile and Logout buttons. The main content includes a Total Product and Category statistics panel, a Products per Category pie chart, a table of the Top 5 Products, and a stock and category management tips panel to support workshop operational efficiency. The manager dashboard page layout can be seen in Figure 11.

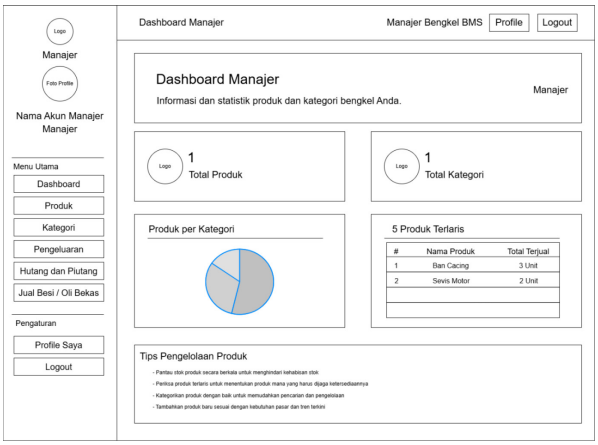

Figure 11. Manager Dashboard Page Design

11. Employee Dashboard Page Design

The employee dashboard page initially had a simple design with two main buttons in the center, namely Transaction Input and Transaction List, and the top section displayed the title "Employee Dashboard", account name, Profile button, and Logout. The bottom section contained the status "Welcome" as a marker for access to the employee admin panel. However, based on the results of validation with the owner of the BMS Workshop on April 30, 2025, this design was refined by the addition of a navigation sidebar to facilitate direct access to features such as the Dashboard, Transaction Input, and Transaction List without having to return to the main page. The sidebar also contains account information, profile photo, username, and Profile and Logout menus to improve comfort and efficiency of use. The design of the employee dashboard page can be seen in Figure 12. And changes to the design of the employee dashboard page can be seen in Figure 13.

Figure 12. Employee Dashboard Page Design

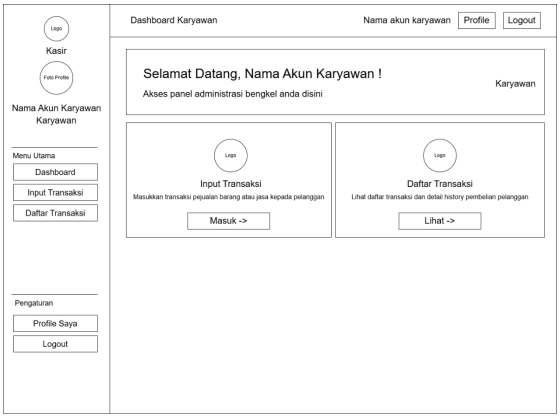

Figure 13. Employee Dashboard Page Design Changes

4.3. Development Stage Results

The development results are an implementation of the previously prepared design stage, which includes two main stages: creating a MySQL database and coding using the PHP programming language to build the interface and functionality of the BMS Workshop website.

1. System Display Development

The system interface development is the implementation of the interface design into a website using PHP, JavaScript, Bootstrap, and CSS. The Bengkel BMS website was developed with key features such as product management, transactions, receivables, cash advances for managers, used goods sales, and financial reports. On the page

before logging in, three access options are displayed according to user roles (Admin, Employee, Manager), complete with a description of access rights and a login button, with a background image of the workshop and a blue color theme as the visual identity of Bengkel BMS. The system interface development can be seen in Figure 14.

Figure 14. System View Development

2. Admin Dashboard Page Development

The admin dashboard page development displays a summary of data such as the number of employees, total sales, a 7-day revenue graph, and usage tips. The design uses a purple theme with a navigation sidebar containing the main menu for managing system data. The admin dashboard page development can be seen in Figure 15.

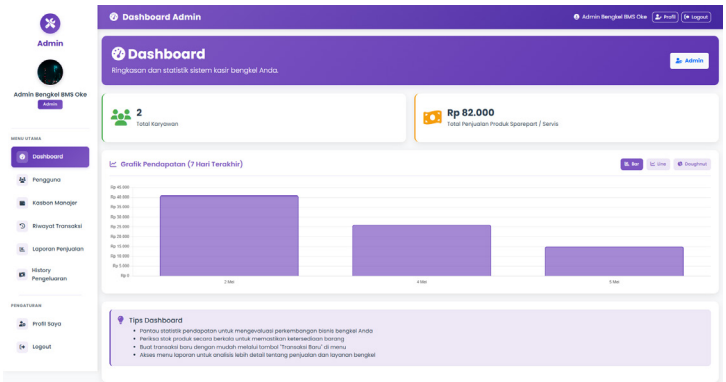

Figure 15. Admin Dashboard Page Development

4.4. Results of the Implementation Phase

The development results are an implementation of the previously prepared design stage, which includes two main stages: creating a MySQL database and coding using the PHP programming language to build the interface and functionality of the BMS Workshop website.

1. Black Box Testing

Black box testing was performed on three main roles in the system: Admin, Manager, and Employee, with test scenarios tailored to each user's access rights and responsibilities. The overall black box testing scenario is shown in Figure 16.

No.	Aktivitas	Langkah uji	Hasil yang diharapkan	Status
1.	Login Admin	Masukkan *username* dan *pazzword* yang valid dan klik *login*.	Admin berhasil *login* dan diarahkan ke halaman *dashboard*.	Berhasil
2.		Masukkan *username* dan *pazzword* yang tidak valid dan klik *login*.	Muncul pesan kesalahan	Berhasil
3.	Pemilihan Menu Navigasi	Klik pada berbagai menu navigasi (*Dashboard*, pengguna, kasbon manajer, riwayat transaksi, laporan penjualan, *history* pengeluaran).	Halaman menu yang sesuai berhasil ditampilkan.	Berhasil
4.	Akses Menu *Dashboard*	Memilih grafik pendapatan dalam bentuk *bar*.	Menampilkan grafik pendapatan dalam bentuk *bar*.	Berhasil
5.		Memilih grafik pendapatan dalam bentuk *line*.	Menampilkan grafik pendapatan dalam bentuk *line*.	Berhasil
6.		Memilih grafik pendapatan dalam bentuk *doughnut*.	Menampilkan grafik pendapatan dalam bentuk *doughnut*.	Berhasil

No.	Aktivitas	Langkah uji	Hasil yang diharapkan	Status
1.	Login Admin	Masukkan *username* dan *password* yang valid dan klik *login*.	Admin berhasil *login* dan diarahkan ke halaman *dashboard*.	Berhasil
2.		Masukkan *username* dan *password* yang tidak valid dan klik *login*.	Muncul pesan kesalahan	Berhasil
3.	Pemilihan Menu Navigasi	Klik pada berbagai menu navigasi (*Dashboard*, pengguna, kasbon manajer, riwayat transaksi, laporan penjualan, *history* pengeluaran).	Halaman menu yang sesuai berhasil ditampilkan.	Berhasil
4.	Akses Menu *Dashboard*	Memilih grafik pendapatan dalam bentuk *bar*.	Menampilkan grafik pendapatan dalam bentuk *bar*.	Berhasil
5.		Memilih grafik pendapatan dalam bentuk *line*.	Menampilkan grafik pendapatan dalam bentuk *line*.	Berhasil
6.		Memilih grafik pendapatan dalam bentuk *doughnut*.	Menampilkan grafik pendapatan dalam bentuk *doughnut*.	Berhasil

No.	Aktivitas	Langkah uji	Hasil yang diharapkan	Status
1.	Login Karyawan	Masukkan *username* dan *password* yang valid dan klik *login*.	Karyawan berhasil *login* dan diarahkan ke halaman *dashboard*.	Berhasil
2.		Masukkan *username* dan *password* yang tidak valid dan klik *login*.	Muncul pesan kesalahan	Berhasil
3.	Pemilihan Menu Navigasi	Klik pada berbagai menu navigasi (*Dashboard, input* transaksi, dan daftar transaksi).	Halaman menu yang sesuai berhasil ditampilkan.	Berhasil
4.	Akses Menu *Dashboard*	Memilih tombol masuk pada *input* transaksi.	Menampilkan halaman *input* transaksi baru.	Berhasil

Figure 16. Black Box Testing

2. User Acceptance Testing (UAT)

User Acceptance Testing (UAT) was conducted in collaboration with the Bengkel BMS team to ensure the system meets user needs. Testing was conducted on May 24, 2025, using scenarios similar to Black Box Testing, focusing on core functions such as transaction recording, inventory management, and financial reporting. Test results showed all features worked smoothly without any issues, thus declaring the system ready for implementation to support Bengkel BMS's operations effectively and efficiently.

5. Conclusion

This research has successfully designed and built a website-based business information system for the Betawi Motor Service (BMS) workshop using the Rapid Application Development (RAD) method. The RAD method consists of four stages: requirements planning, system design, development, and implementation. This approach allows for a rapid and iterative development process.

This system is designed to support the digitalization of workshop operations by providing integrated, real-time features for transaction recording, inventory management, and financial reporting. The system supports three user types: admin, manager, and employee, with access rights tailored to their respective roles.

Based on the results of testing using Black Box Testing and User Acceptance Testing (UAT), all key system functions functioned smoothly without any errors, ensuring the system meets the functional requirements of the BMS workshop. The system can be accessed online at https://bengkelbms.zya.me/ and has successfully supported the operational digitalization process at the BMS workshop.

In the system developed for the website-based BMS workshop, payments are still made in cash or via bank transfer. Further development of this system could include integration with digital payment services (fintech) such as QRIS, e-wallets, or other payment gateways to facilitate customer transactions and improve payment efficiency.

Furthermore, the existing system could be expanded with various additional features to enhance customer convenience and satisfaction. One such feature is providing customers with dedicated access through a platform that allows them to monitor their vehicle's status in real time. Customers can see if their vehicle is undergoing repairs, which parts are being repaired, and the estimated completion time.

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