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Web and Android-Based Motorcycle Service and Maintenance Application

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Abstract: The study is to develop a web- and Android-based application for motorcycle servicing and maintenance in helping Bendho Motor in sales tracking records as well as reporting. Application helps mechanics drive business and the owner to have effective sales performance checks. First data collection were watched workshop work and the understanding of practice business processes, interviews to workshop owner to know his/her operational difficulties. We did system analysis so as to apply the application in PHP, CSS and further frameworks. Service orders were previously manually registered leading to problems including incorrect data, illegible and lost receipts. The proposed app solves the problems of storing order histories securely and guarantee integrity of transaction.

Keywords: Application; Website; Android; Motorcycle Service; Motorcycle Maintenance.

1. Introduction

At Present the motorcycle service order system at Bendho Motor still applies notes, customer or clients wanting a service will vocalized their orders with mechanic, after that the mechanic will write down what service orders the customer needed and this proof of payment note will be used instead. The order notes of the customer are the basis for reports she writes out Bendho Motor, sometimes there are still order notes done by hand that hinder an obstacle cause the writing is inhuman and appears smeared with oil on the order note, so recording orders and orders are mixed up as an error and order notes may get lost so that there shall be problems in sales reported, because order notes are a recorded report. A Web Application and a Android application for motorcycle service and maintenance, is developed because of the problems that happen such as a solution to assist Bendho Motor in sales registering, product sales registering. Based on the description of the background, the formulation of the problems that can be pursued is "can an application solve its own problems at the time of scheduling motorcycle service and examining motorcycle level maintenance level faced by bike owners or mechanics" and recording motorcycle workshop data on service users who subscribe for

servicing motorcycle. Based on the limitation of formulated problem from what has been stated above, the purpose of this research is to suggest "Servis Moto Garage" able to carry out online orders at motorcycle workshop in bike service that can manage user reservation regarding motorcycle service at Bendho Motor itself so that also solve owner problems, to inform customer order status and also to help mechanic identify which is take priority ordering from all customers. Application Program is a program that comes ready to use, or an application made for users and other computer applications to work. General meaning of "use" or in this case the actual concept that is the subject being discussed or an algorithmic computer program written to help humans perform tasks, i.e. applications. Based on the Android for the Linux-based smartphones and tablet computers of compact operating system, which include an operating system, middleware etc.. Android is also a free software like/Open Source that can developers creative their own applications [1][2]. A site is an electronic medium with multiple pages that interconnected, the website has as a fiduciary one of information provide in texts, images, videos, sounds and animations developed on localhost mode of meant that you can design, develop and modify a page even no using internet is available on domain as an address (url) or wide web (WWW) and also hosting is a lot of where data sitting [5]. Motorcycles are the main type of transportation for the people of Indonesia besides being cheap, motorcycles can also be used on different roads. Nowadays more and more motorcycles used as one means of transportation which leads to air pollution and this phenomenon has already been observed not only in big cities such a jakarta, but in most part of the area. Mechanic shop– Mechanic shop is a place where a mechanic works, and he works on the repair and overhaul of vehicles. A Service Gym is a motor vehicle shop which repair and service gears so that they fulfill vehicle specifications and are roadworthy [3]. RESTful APIs — develop on the foundation of representational state transfer (REST) …… architecture and communication pattern mainly use in the web service development. The idea of REST API design was first introduced by Dr. Roey Fielding in his 2000 doctoral dissertation. One thing that makes REST APIs so desirable is their flexibility by the nature of Data is not bound to methods or resources, REST has a capacity to support multiple call types, varieties of data returned and changes structurally through suitable implementation [4]. The browsers based rest can is likely going to be the language of the web. More over with cloud will cost APIs were born where make web services accessible. Given REST ful is awesome way to create APIs that let users hook up, use cloud services. APIs are used by sites like Amazon, Google, LinkedIn and twitter [6][12].

Laravel is a PHP framework created by Taylor Otwell and licensed under MIT, based on the MVC (Model View Controller) architecture for creating a website. Laravel is an MVP website framework in PHP Created to Increase Software Quality where initial costs of the development and maintenance costs are reduced. A database system is a collection of computerized files and records to retain data so that it is available when required. This is called, "A database is used as a medium to store the data where data can be accessed easily and quickly". A database (or database) in the context of the 8 means data collection that have been standardized set using software to be able to manage so that it is easier to work [7][8]. Data Flow Diagram (DFD), or Indonesian DAD, is a graphical notation for describing the flow and transformations data/information flows through an information system. DFD The DFD stands to represent a system or software at different levels more detail to indicate the minor more specific flows, functions. DFD provide a model for functional- or information flow modeling. Therefore, DFD is better for presenting what the software will have to do in smaller parts which breaks these into functions and procedures rather [9][13]. A flowchart is simply an image or diagram used for sequential one or two-way flow to present or describe the programs as a stage in solving a problem simple, clearly but surely separated and neatly as possible through standard symbols for programming language designed to describe writing. UML is the technique of system development use graphical language to represent and specify the system. Further on, based on this understanding this can be said that UML is an object-oriented design technique which is easier to understand because of it is supported by diagrams. PHP is a server-side script, meaning the processing of the code is done at server end and the result will be shown in the browser where PHP works within an HTML document that creates actual page contents for a website page by fulfilling request. Researchers use PHP as a programming to actually turn lines of program code in the form of scripts, where the code processing is done at server and will be shown on the browser. PHP means in an HTML document be able to create the appearance of a web page as interpreted PHP. HTML is the markup language used to design a website page, display multi-information on the internet browser and Quotational Hypertext (writing AB) format files to engrave a unified appearance of primary HTML files. Bootstrap is a front end development framework which, following enhancement of the screen size and browser used in desktops; or tablets or mobile. Developers use Bootstrap to built either static or dynamic site more comfortably and quickly [15].

2. Research Method

Develop a web-based and mobile app support Services motorcycle & maintenance at Bendho Motor workshop This research was done at many stages, beginning by data collection, business rule analysis and system implementation. Data used was data from the historical operation of the workshop which has been established in Jalan Kabupaten Kronggahan, Gamping District, Sleman Regency, Special Region of Yogyakarta from 2019. Data collection was using observation, interviews and secondary data. Observation was done by observing the business process itself and witnessed how customers coming to the workshop, complain about the motorcycle, service end up to payment delivering. Researchers through observation could understand the operational chain and obstacles, such as the difficulty in entering customer orders manually. Moreover, in depth interviews were done with the workshop owner to get data on the operational issues, mission statement and vision and other practical challenges faced by business model. It gave me a visualization, interview this or that -- the use cases i needed to develop for a system that would be improving work efficiency and data population accuracy. Also, secondary data sources were gathered through searches in different instances e.g. website, Google Maps articles and other applicable references. The secondary data mentioned is helpful to complement the information received from observation and interview, thus complete profile of need /potential application development.

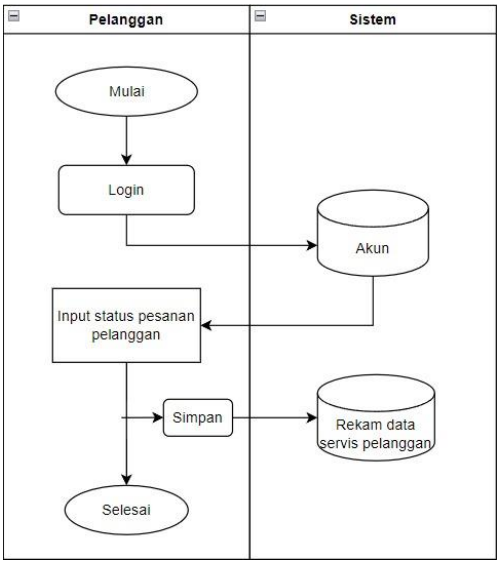

Figure 1. Waterfall Method

We, on the other hand did three stage research. Observational study at first to learn the business rules, using any tools i have available like interviewing customers mechanics and the mechanics themselves. This observation will probably comprises to listed out the aspect of necessity of being simplified through the application that we are going to design. Next, the second stage consisted of a qualitative interview with shop owners to strengthen my observation results. What gave the owner of the system details of his specific problems, needs in first place and afterward what he wanted from new system that has to be developed. The finding of the interview are the part basic data for designing app features with mechanic operational needs. In the end all the systems were analyzed designed and developed for web capabilities, as well Android Application of our research. System Analysis aimed at making a straight forward application based framework like customer data maintenance, service scheduling management and transactions record. Application Design is done using PHP, CSS and one more frameworks that help to give real time data integration, so one can reduce manual errors which transpire during recording. This study was completed over a period of three months, from background and till system analysis and design. To shortly this research method, expected can produce an application in solving the problem of recording mechanic work directly with number of automobil in there, automated mechanic work efficiency and optim concentrated work at workshop updated database implementation.

3. Result and Discussion

3.1 Results

3.1.1 System Analysis

System analysis refers to the process of studying procedures related to business operations to ensure that systems and processes function more efficiently. The ordering system at Bendho Motor operates as follows: customers visit the workshop and report issues or problems with their motorcycles to the admin. The admin records the customer's order, and the system generates an order receipt provided to the mechanic. The mechanic then performs the requested service or maintenance. Once completed, the mechanic returns the serviced motorcycle to the customer. This process currently relies on manual recording, which poses risks such as errors in order entry, illegible handwriting, and misplaced receipts. The workflow of the current ordering system is depicted in Figure 2.

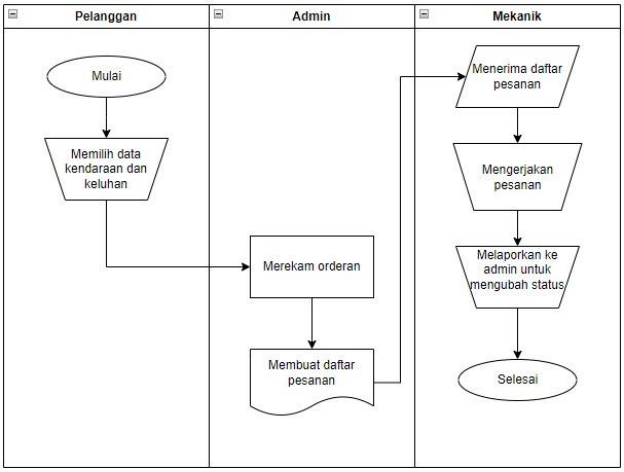

Figure 2. Current Order System Workflow

To support operations, Bendho Motor requires monthly reports generated from daily transaction data. Mechanics submit daily sales records to the admin, who consolidates this information to create monthly reports. Once completed, the reports are submitted to the owner for review and approval. Any discrepancies found in the report are revised, and the finalized report is stored for record-keeping. The workflow of the existing sales reporting system is shown in Figure 3.

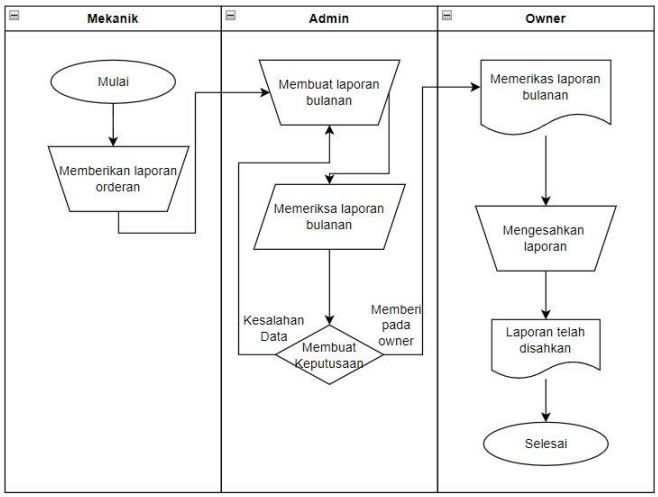

Figure 3. Current Sales Reporting Workflow

3.1.2 System Design

The use case diagram illustrates interactions between the system and its users. In this system, the admin has access to login, manage master data, and handle order reports. The owner has similar access rights

as the admin, while mechanics have limited access to login and handle sales transactions. The detailed representation can be seen in Figure 4.

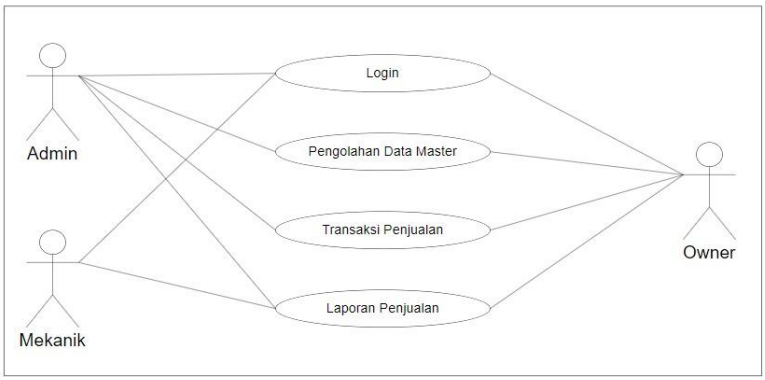

Figure 4. Use Case Diagram

Activity diagrams provide a detailed representation of specific processes within the system. The login activity diagram outlines the flow from users entering their credentials to gaining access to the system. This is illustrated in Figure 5. The activity diagram for managing master data illustrates the process for handling user data, orders, and access rights. This diagram is shown in Figure 6.

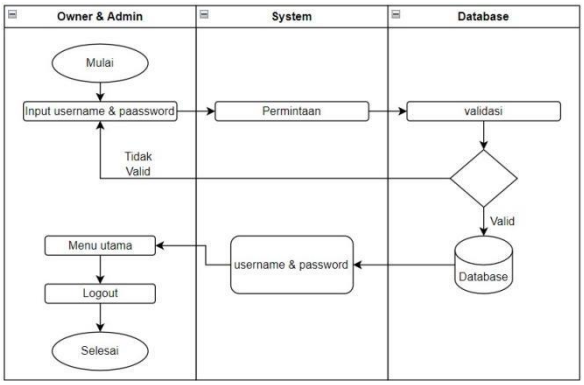

Figure 5. Login Activity Diagram

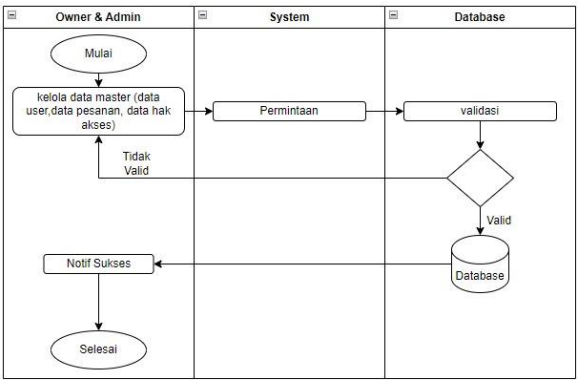

Figure 6. Master Data Management Activity Diagram

3.1.3 Interface Design

The registration page is the initial interface that allows new users to create an account by entering their name, email, and password. The design of the registration page is depicted in Figure 7.

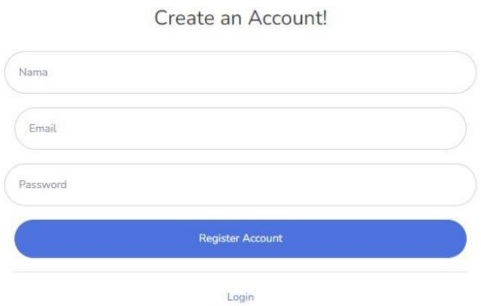

Figure 7. Website Registration Page Design

Registered users can access the system by entering their email and password on the login page. The designs for the web-based and Android login pages are shown in Figure 8 and Figure 9, respectively.

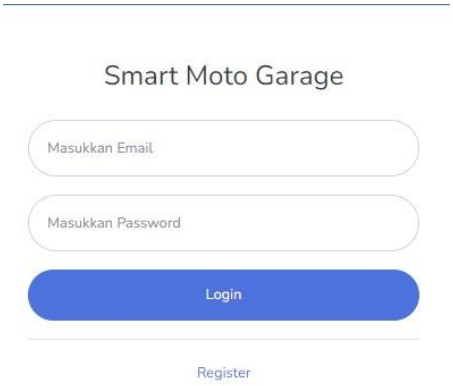

Figure 8. Web Login Page Design

Figure 9. Android Login Page Design

The dashboard is the first page displayed to users upon successful login. It provides an overview of key system features and access options. The designs for the admin and user dashboards are shown in Figure 10 and Figure 11.

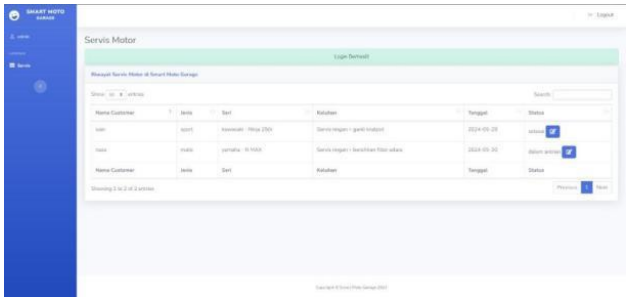

Figure 10. Admin Dashboard Design

Figure 11. Android User Dashboard Design

The order management page allows admins and users to view and manage order data, add new orders, and update order statuses. The designs for these pages are illustrated in Figure 12 and Figure 13.

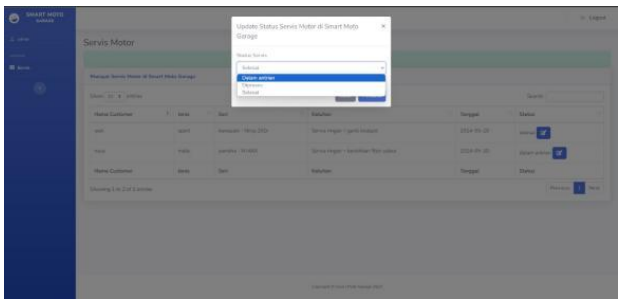

Figure 12. Admin Order Management Page Design

Figure 13. User Order Management Page Design

3.1.4 System Testing

System testing aims to verify that the developed system functions as expected. Various scenarios were tested to ensure proper functionality. The registration page was tested to ensure that new users can successfully create an account. The results of the testing are presented in Table 1 for the admin and Table 2 for users.

Table 1. Admin Registration Page Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
Admin enters name, email, and password	Clicks "Register"	Displays login page	As expected	Successful

Table 2. User Registration Page Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
User enters name, email, and password	Clicks "Sign Up"	Displays login page	As expected	Successful

The login page was tested to ensure that users can log in to the system using valid credentials. The test results are presented in Table 3.

Table 3. Login Page Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
Admin and user enter valid email and password	Clicks "Login"	Displays dashboard or shows error message if invalid credentials are entered	As expected	Successful

The dashboard was tested to confirm that users can access key features after logging in. The results for users and admins are provided in Table 4 and Table 5.

Table 4. User Dashboard Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
User enters motorcycle details	Clicks "Submit"	Displays order page	As expected	Successful

Table 5. Admin Dashboard Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
Admin receives customer order	Clicks "Update Status"	Updates order status successfully	As expected	Successful

The order management page was tested to ensure that admins and users could view and update order statuses. The results are presented in Table 6 and Table 7.

Table 6. Admin Order Management Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
Admin updates order status	Clicks "Update Status"	Successfully updates order status	As expected	Successful

Table 7. User Order Management Testing

Scenario	Test Case	Expected Outcome	Test Result	Conclusion
User views order status	-	Displays correct order status	As expected	Successful

3.2 Discussion

Bendho Motor results of the analysis, design and test from System to deliver solution through web as well Android-based app for operational deficiences in Bendho Motor showed that the results are successful. In the past, the manual order system was almost a complete piece of paper and data dump requiring legibility of handwriting, stolen receipts, and not the right numbers put into the system. By comparison, the new system has no questions like this because order management is automatically digitized and all transaction data is securely stored in one centrally managed database. This method helps, not only make sure you guarantee integrity in your data but also decrease procedure work force fatigue (not mech and admin) greatly. The automation of monthly reporting again simplifies systems of record workflows and makes business data more reliable, provided by the system's processes in figures 2 and 3.

As would be expected, the system design shows a high correlation with the operational needs of Bendho Motor. Accurate access rights of different user roles, such as admin, mechanics and owner is provided as through Figure 4 that helped all has access what he/she needs to do his task structurally and efficiently. This structured access control, on the other hand makes it more usable than any abstraction (e.g., password managers) but also reduces complexity. Figures 5 and 6: Handling processes like login authentication or master data management rendered with activity diagrams. Further user experience enhancement is provided by interface designs. Figure 7 (registration page), which provides an on-boarding flow for 1st-time users while Fig 8 & 9 ensure that the login pages are secure. Both users and administrators are taken to dashboards that

displayed key functions in an easily scannable format (Figs. 10-11) when log in. Besides this, the order management pages (12 and 13) allows both user and admin to track changes, update satisfactory orders which reduces possible miscomand or time delay in operation.

System Testing also validated all of the functional requirements of the application were met through successful test scenarios. The registration was thoroughly validated, data could be created for both admin and user accounts without errors [] table 1Table 2 In the login procedure, it was proven that there only has user in system because users logged in correctly and too (Table 3). Local storage supports the traceability and gives owner with useful insights for a timely decision (Table 4). Admins and Users were each presented with a useful dashboard that conveyed the information and allowed the operational actions (tables 4 and 5) at a glance so operations could be properly transparent. The order management system also synthesized order statuses so that (as displayed in Tables 6 &7) a better communication between customer and mechanics as well administrative staff was achieved.

The system developed has a great practical implication for Bendho Motor. Automating service orders and managing smooth workflows take away the dependent process where vital manual intervention/risks are prone to numerous potential errors by using the application to make operations more efficient and accurate. The centralized storage of data makes it easier for the owner to trace and provide behind-the-scenes support in real-time. Customers: system updates in real-time (order status) making itself possible additional transparency and convenience. It enhances communication for workshop staff, decreases administrative tasks and improves the quality overall service. The system has some limitations that are worth mentioning, even though it has been successful in the past. Presently, system relies on user-data that can come with errors if not closely watched while devising your plan. Future release might add features like automated data validation rules to prevent data entry errors. Also, having predictive analytics to forecast service times or determine root-cause would make the system useful to an even greater extent. Scaling to multiple workshop locations and including the ability to manage customer feedback systems, loyalty programs would make it applicable for larger enterprises rather expand the compression.

This study advances our understanding of the field as a set of empirical guidelines for implementing web- and Android-based application to improve small and medium business (SMB) operations. Using a blend of systematic analysis, engineering design and refine execution within this ecosystem underscores how technology can be used to cut out manual omissions in bespoke workflows and processes or services industry respectively. The results, and methodology are relevant for other projects tackling the same target problem, applying digital solutions to improve operational processes.

4. Related Work

The current study was based on relevant literature reviews to assist in the development of a web and an Android application system that will web application for vehicle maintenance and services management. All of which makes for an acceptable base to bring in many modern tools in automotive service management. In the study Firebase API was studied by Agus Tri Wahyu (2020) to be used for store user and service on Firebase database. The app (written in Java with technologies such as Firebase, Google Maps API) that is able to be accessed with android devices, thus promoting user-friendliness and running efficiency [9]. The Google Maps integration to reach the nearest motorcycle service center was the focus of study by Faiz Ataka Ubaidillah and Anita Fira Waluyo (2023). As indicated in the research of Putri Agisti Patila, Muhammad Rifai Katili (2020),the Information system of motorcycle service management in PT HAG was developed by Waterfall model utilizing PHP,HTML, JavaScript; Kotlin and MySQl which resulted improved version in terms of user experience and competitive advantages [1]. Developed using Waterfall methodology, Ryan Nanda Firdaus (2022) created a system for motorcycle service (booking and inventory management at Sadermo Motor Workshop. This system handles the sales part management data, service records including transaction report and invoice creation in a unified as well as efficiently managing the methods of manualmanagement [10] Another Rngi Akdam Kurnia (2017) research accounts for the development of a web-based application that helps with spare part sales management and motorcycle servicing. PHP and MySQL are used on the system, enhancing productivity in administrative functions and service operations [5]. Holis Muchlis Sugianto and Asti Herliana (2020) developed an Android app that reminds and monitors motorcycle service cycle using the development methods of automation For maintenance schedules from a notification feature, this helps users keep up with servicing their vehicles [4]. Restful API implementation in online motorcycle spare parts market by Bariz Mar Aziz (2020). Flexible flexible use of RESTful API functionality and Operations Management also effective data management are ensured due to cloud-based applications with response time and bandwidth requirements [12].

Other studies define more application themes using advanced technologies; IoT (Internet of Things), RESTful API, machine learning and cloud based service for automation of automotive services. Ahmed and Patel (2023) said that IoT in automotive workshop management part for mechanics to get required data of vehicles in real time for diagnostics and as well it helps in correct estimation of service times [6]. Kumar & Singh (2023) developed a predictive Android based application using machine learning. This app analyzes patterns in the way vehicles are driven, and offers predictive maintenance recommendations to reduce service time, which can extend your vehicles useful life [7]. Zhang and Lee 2022 discussed the automotive service in cloud-based solutions. These solutions scale, keep you safe with data encryption & allow multi-site cross-platform communication [8]. WhatsApp and Johnson and Brown (2022) As the frequency of intuitive UI (User interface) based service application is required for customers, they proved to be happy [13], studies by Sianturi (2023), Guntara (2023) RESTful API on the provision of orderly and faultless data transfer among applications as well as databases, such as automotive service management [16][17]. Fitriani *et al*. (2022) RESTful API was shown to have consistent results for data synchronization between application systems [20]. Evidence from (Panggabean, 2022) The performance and data management should be enhanced by implementing Electronic Supply Chain Management (e-SCM) in the automotive industry [21]. Lapatta (2024) Used logistic regression algorithms for predicting the likely customers in the automotive industry and marketing strategy development [22][23][24]. Review proceeds to show impact of modern technologies on increasing efficiency, accuracy and user satisfaction in automotive services. The application initiated for the cloud-based and machine learning model of Bengkel Motor "Bendho Motor" addresses many operational issues Inclination which aims to get responsive solution for user requirements, improve operational efficiency and customer value. This research is advancing a fundamental move to introduce technology-based innovations in the automotive industry.

5. Conclusion

From analysis stages, design stages, implementation stages and system testing that have been performed, the result on the operation of ordering services and maintenance through the web- and Android applications is that it can be accessed easily with the system being developed. Mechanics were required to manually record orders of customers via the service & maintenance ordering process, before this application even existed and created messes like extreme illegibility with pen and paper prior. The biggest challenge was that the physical receipt was lost and as such losing receipts was a major problem that added more operational challenges. The web- and Android-based application helps to tackle these problems by using order history features to keep the order data in a safe storage, thus avoid the risk of lost receipts and also ensures accurate, reliable order management. It improves efficiency in running operations and decreases the possibility of human errors for the motorcycle service and maintenance process.

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