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MOTORCYCLE WORKSHOP INVENTTORY MANAGEMENT SYSTEM WITH DIGITAL FEEDBACK

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Article Info	Abstract
	Effective inventory management is essential for motorcycle workshops as it ensures the availability of necessary parts, optimizes stock levels, and enhances overall operational efficiency. In the context of Hairul Motor Service, a small motorcycle workshop, traditional manual inventory management methods have led to significant challenges such as inconsistent stock levels, difficulty in tracking customer and service records, and a lack of centralized feedback mechanisms. To address these issues, the project aims to develop a Motorcycle Workshop Inventory Management System with Digital Feedback. This system is designed to streamline inventory management, organize customer data, and facilitate efficient feedback collection through a digital platform. The project employs the Waterfall methodology to ensure a structured development process, progressing through stages of requirement gathering, design, implementation, testing, and maintenance. The findings from the implementation of this system indicate substantial improvements in inventory accuracy, reduction in stockouts, better customer service through organized data, and enhanced feedback collection and analysis. These outcomes demonstrate the system's effectiveness in addressing the workshop's operational challenges. The project concludes that adopting such a system can significantly optimize workshop operations, and it suggests ongoing monitoring, user training, and further system enhancements for sustained benefits. In the future, it is recommended to include integrating payment processing, linking with external systems, and incorporating robust data analytics tools to further improve efficiency and customer satisfaction.

INTRODUCTION

Motorcycle workshops play a crucial role in vehicle maintenance, yet smaller or newer ones often face challenges in visibility and effective management. Customer decisions rely not just

on reputation but also on service quality, expertise of mechanics, and efficient management. The stakeholder, a small workshop established in 2006, currently uses manual processes for inventory, customer data, and feedback management, leading to issues like delays and financial inefficiencies. The workshop's owner sees the potential of a digital inventory management system to address these challenges, streamline operations, and enhance customer satisfaction.

Problem Statement

Difficulty To Manage Inventory Manually

Stakeholder is encountering significant challenges as a result of their outdated inventory management practices. Despite the availability of modern methods, they persist in using manual bookkeeping to track their inventory, resulting in inconsistent stock levels of motorcycle parts and accessories. This inconsistency not only leads to financial losses but also contributes to prolonged customer service durations. Additionally, their reliance on outdated systems is causing harm to their reputation and eroding their competitive advantage in the market.

Difficulty To Trace Customer and Service Record

Stakeholder is facing challenges with their customer data and service records being disorganized, making it difficult to manage customer relationships, offer personalized service, and track service histories. Their dependence on manual methods like using a book to record data adds to the complexity, restricting their daily operations and hindering their ability to provide customized and high-quality service. Furthermore, this manual process slows down the team, reducing their efficiency in managing workflow and delivering services promptly.

Difficulty To Gather Feedback and Review from Customers

Stakeholder presently collects feedback and reviews from various social media platforms like Facebook and TikTok. However, this approach poses challenges as it lacks centralization, and social media platforms are not specifically structured for gathering feedback and reviews. Consequently, feedback and reviews are dispersed across comments and replies, complicating the organization and analysis process.
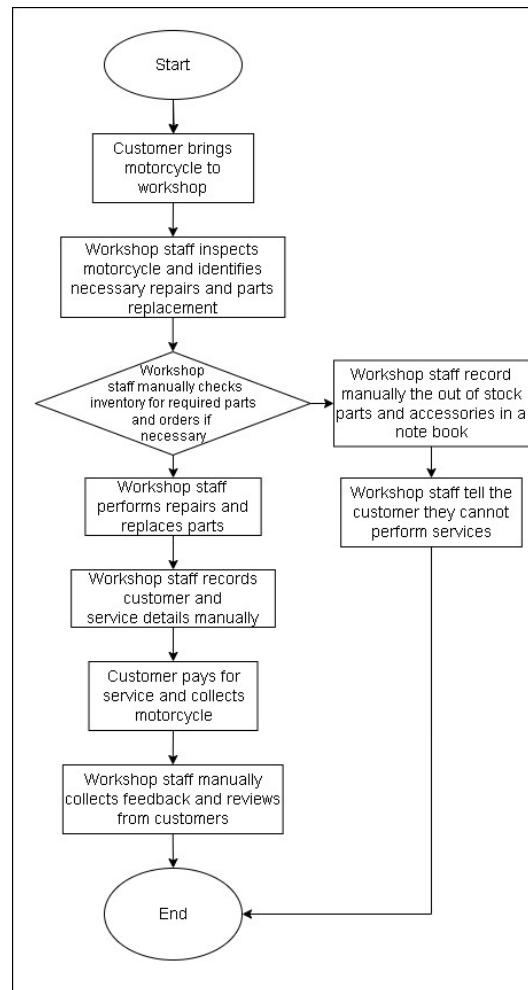
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Figure 1: Current Process Flowchart of Hairul Motor Service

Objective

The objectives of this project are:

1. To gather and analyze requirement from Hairul Motor Service.

2. To design the Motorcycle Workshop Inventory Management System with Digital Feedback for Hairul Motor Service.

3. To develop the Motorcycle Workshop Management System with Digital Feedback for Hairul Motor Service.

Project Scope

The scope of the Motorcycle Workshop Management System with Digital Feedback focuses on the development of a web-based system using PHP for motorcycle workshop. This system will manage inventory, store records of customers and services, maintain a database, and collect feedback and reviews from customers. The stakeholder of this project is Encik Hairul Faaiz Bin Mahat, who is the owner of Hairul Motor Service.

Project Significance

The development of the Motorcycle workshop Management System with Digital Feedback for stakeholder is poised to significantly enhance operational efficiency, streamline workflows, and improve customer satisfaction in the automotive service industry. By resolving manual inventory challenges, organizing customer records, and implementing a structured feedback system, this project aims to set a new standard for service quality. Its potential for scalability not only benefits stakeholder but also offers a blueprint for similar businesses, paving the way for industry-wide improvements in customer service and operational effectiveness.

LITERATURE REVIEW

Inventory Management

Inventory management encompasses all the activities involved in overseeing the flow of goods from acquisition to sale. This includes the purchasing, storage, utilization, and sale of raw materials, components, and finished goods, as well as the warehousing and processing of such items. Diverse inventory management methodologies exist, each with its own set of advantages and disadvantages, which must be tailored to the specific requirements of a company (Hayes, 2023). Inventory Management is a crucial aspect of business management that focuses on strategic planning and controlling the levels of goods or stock maintained by a company (Toomey, 2000). Its primary objective is to ensure the optimal availability of specific products or items in accordance with established requirements. The systems employed for inventory management must be tailored to the specific characteristics of the products, the customer demands, and the processes involved in manufacturing or procuring the goods.

Online Database

Online databases are fundamental technological tools for supporting research, granting researchers access to a broader selection of scientifically aggregated published research materials of their preference (Izuagbe, 2021). These databases, offered as a service by database providers or vendors, enable users to conduct searches through a local computer that communicates with distant systems housing vast information content (Deepmala, Ashok, & Sharma, 2020). The convenience and accessibility of online databases have revolutionized the research landscape, providing unprecedented access to a wealth of knowledge and facilitating more efficient and comprehensive literature reviews (Smith, 2022).

Feedback and Review

Feedback and review are essential elements in many fields, providing critical information that can guide improvements and validate performance. Feedback is defined as information provided by an agent (e.g., teacher, peer, book, parent, self) regarding aspects of one's performance or understanding (Brookhart, 2017). It serves as a mechanism for enhancing performance and understanding by closing the gap between current and desired performance (Sadler, 1989). Feedback can be formative, intended to inform future performance and development, or summative, evaluating performance at a specific point in time (Wiliam, 2011).

Reviews involve a more comprehensive evaluation or assessment of a product, performance, or work. They can be internal, such as peer reviews within an organization, or external, such as customer reviews or expert evaluations. Reviews typically encompass multiple aspects of the subject being reviewed, providing a holistic assessment rather than focusing on specific elements like feedback (Gielen, Peeters, Dochy, Onghena, & Struyven, 2010).

Notification

Notifications are alerts or messages designed to capture user attention by providing information about events or updates. They serve as external signals that draw a user's attention to specific information, applications, or events (Pielot, Church, & de Oliveira, 2014, p. 233). These alerts come in various forms, such as push notifications sent by applications to inform users of new messages or updates, pull notifications that require users to actively check for updates like refreshing an email inbox, in-app notifications embedded within application

interfaces to provide real-time, context-specific information, and system notifications generated by operating systems for critical events like low battery warnings or software updates (Fischer, Greenhalgh, & Benford, 2010).

Notifications on mobile phones inform users about a variety of events, such as the arrival of a message, a new comment on one of their social network posts, or the availability of an application update. Some notifications, such as application updates, appear silently, whereas others (e.g., incoming short messages) can create brief visual, auditory, and/or tactile signals to capture the user's attention. While in some cases immediate action is taken by the users, in other cases notifications are widely ignored depending on their importance and the user's current context. A unified method to present notifications is used on current iPhone and Android platforms (Sahami Shirazi, Alireza, Henze, Niels, Dingler, Tilman, Schmidt, Albrecht, and Boll, Susanne, 2014).

METHODOLOGY

The Waterfall model represents a sequential project management methodology where each phase concludes before the subsequent one commences. It comprises six distinct phases: Requirements, Design, Implementation, Verification, Deployment, and Maintenance. The Waterfall approach is known for its simplicity, making it easy to comprehend and manage production issues. This process also facilitates effective budget control in Software Development (Sinha & Das, 2021).

Operating in a sequential manner, the Waterfall model resembles a cascading waterfall, initiating with a well-documented requirements phase. Since the model mandates thorough documentation of requirements before proceeding to other project phases, project managers invest substantial time in gathering detailed requirements. Beginning with a conceptualization or idea of the customer's needs, the project manager collaborates with customers, subject matter experts, and stakeholders to define precise business requirements. The project team then approves and completes the requirements phase before progressing to the subsequent phase, such as design.

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Waterfall Methodology Phases

The first phase is the requirement gathering phase, where the project requirements are identified and documented. This is followed by the analysis phase, where the requirements are analyzed and transformed into a system design. The design phase focuses on creating a detailed blueprint of the system architecture and functionalities. Once the design is finalized, the implementation phase begins, where the actual coding and development of the software takes place.
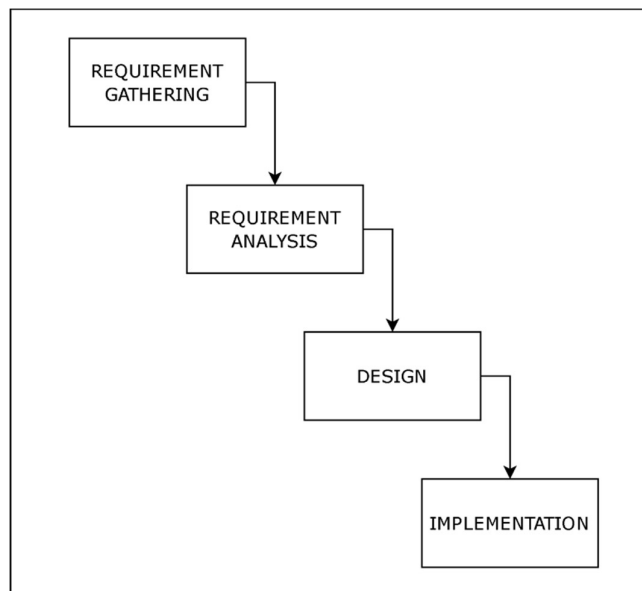

Figure 2: Implemented Waterfall model for project development process for Motorcycle Workshop Inventory

Requirement Gathering Phase

The first phase of the methodology is requirements gathering. This includes gathering project requirements from the stakeholder, En. Hairul Faaiz Bin Mahat, owner of Hairul Motor Service. This document serves as the foundation for the project's subsequent phases. To gather requirements, interview questions were prepared in advance for En. Hairul's response before the interview. Then, A face-to-face interview was conducted with En. Hairul to gain a deeper understanding of inventory management.

Table 1: Questions for the interview session

No	Question
1	How do you manage inventory/stock?
2	Do inventory/stock issues result in financial losses?
3	Do inventory/stock issues result in customer satisfaction problems?
4	Do you store customer information?
5	Do you keep records of your customer service?
6	Do you collect feedback and comments from your customers?
7	How do you collect feedback and comments from your customers, if any?

Analysis Phase

After obtaining the data requirement, the subsequent stage is the Analysis phase, during which activities involve comprehending and processing the gathered requirements. This includes analyzing questionnaire results from stakeholder responses, creating requirement diagrams, documentation, and compiling identified requirements.

The outcomes of the analysis encompass deliverables, namely a comprehensive list of identified requirements to ensure a clear understanding of project needs. These requirements will be visually represented through diagrams such as the Use Case diagram, Activity diagram, Domain Class diagram, and Sequence diagram. The documentation of this phase is articulated in the Software Requirement Specification (SRS), providing a detailed blueprint for the development process.

Design Phase

The design phase is where the Motorcycle Workshop Management System with Digital Feedback takes shape. During this stage, the system's database is formulated, the architecture of the system is delineated, a storyboard for the proposed system's interface is crafted, and a comprehensive documentation of the system design is compiled. This documentation encompasses an Entity Relationship Diagram (ERD) for a well-organized database, a Multilayer Sequence Diagram (MLSD), and Design Class Diagram (DCD) to depict the system's architecture, and a storyboard outlining the mobile app's interface. These details are also encapsulated in the Software Design Documentation (SDD), serving as a comprehensive guide for the design of the Motorcycle Workshop Management System with Digital Feedback.

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Implementation Phase

The implementation phase focuses on building the system based on the collected requirements and designed framework. The development process begins by coding the system in small modules using the selected programming language. The implementation requires specific hardware and software. The software used includes essential tools for system development and documentation. Microsoft Word is utilized for report writing, while Google Chrome is the primary browser for research. Visual Studio Code is employed for coding the system, with MySQL serving as the database for data storage and retrieval. PHP is the programming language used, while Draw.io is utilized for diagram creation. Additionally, Gmail is used to manage notifications. This combination of hardware and software ensures a smooth implementation process, enabling efficient system development and project completion.
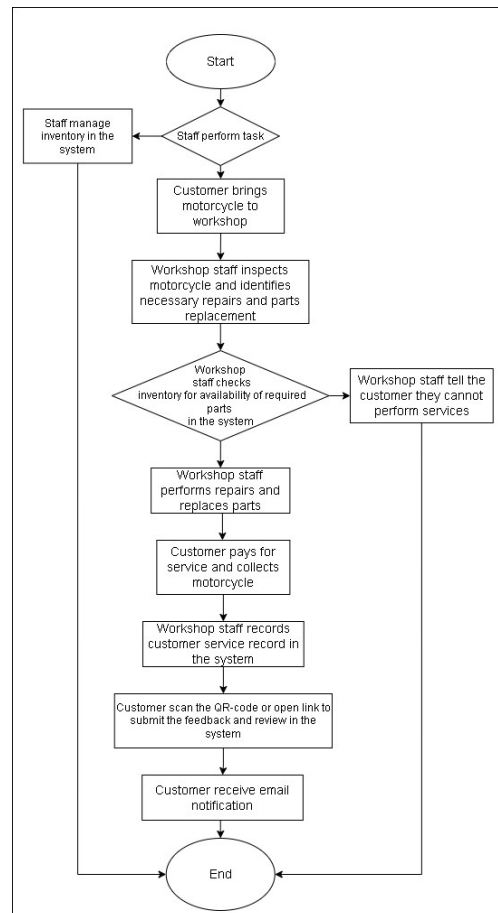

Figure 3: Suggested Current Process for Hairul Motor Service

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RESULT AND DISCUSSION

This section presents the outcomes of developing the "Motorcycle Workshop Inventory Management System with Digital Feedback." It systematically details the project development process using the Waterfall methodology, covering the requirement gathering, analysis, design, and implementation phases. The requirements gathering phase involved extensive stakeholder interviews, leading to the creation of key diagrams such as the Use Case Diagram (UCD) and System Sequence Diagram, which served as blueprints for the system's functionalities. During the analysis phase, these requirements were meticulously analyzed, resulting in the development of visual tools like the Activity Diagram and Domain Class Diagram, which were crucial for understanding system operations and user interactions. In the design phase, detailed system diagrams, including the Multilayer Sequence Diagram, Entity Relationship Diagram, and Package Diagram, were created to ensure that the system's structure was well-defined and aligned with project objectives. The implementation phase focused on coding, database setup, and the development of key features, with a particular emphasis on designing user interfaces based on the previously developed storyboard.

Discussion

The project successfully achieved its objectives by developing the "Motorcycle Workshop Inventory Management System with Digital Feedback." The first objective, which involved gathering and analyzing data from Hairul Motor Service, was met through stakeholder interviews and the creation of critical diagrams, including the Use Case and Activity Diagrams, documented in the Software Requirements Specification (SRS). The second objective, focused on designing the system, resulted in key deliverables such as the user interface storyboard, Entity Relationship Diagram, and Software Design Document (SDD). Finally, the third objective was accomplished with the system's development, leading to a functional prototype and a fully implemented database, thereby fulfilling all project goals.

CONCLUSION

The Motorcycle Workshop Inventory Management System with Digital Feedback enhances inventory management, customer service records, and feedback collection by

automating processes, minimizing errors, and ensuring data consistency. Features like low stock reminders help maintain optimal inventory levels. Its streamlined approach reduces redundancy, optimizes workflows, and saves resources, enabling Hairul Motor Service to operate efficiently, adapt to market changes, and achieve higher productivity and customer satisfaction.

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