Information System for Managing Work Requests and Monitoring Dental Prosthesis Laboratory Services at Quality Dental Care Semarang

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The denture laboratory plays a crucial role in supporting dental clinic services, especially in providing prosthetic products that are delivered on time and meet the medical needs of patients. At Quality Dental Care Semarang, the management of job requests and the recording of service process statuses are still done manually, which can lead to delays in information flow, difficulties in monitoring job statuses, and obstacles in performance evaluation. This study aims to develop a web based information system for managing job requests and monitoring the services of the denture laboratory using PHP, HTML, and MySQL. Through the Research and Development (RAD) method, the stages involved include needs analysis, design, implementation, and functional testing. The developed system provides features for recording job requests, monitoring process statuses, recording completion times, and generating reports, all integrated into a single database. The results of functional testing show that this system successfully improves workflow organization, enhances information management efficiency, and facilitates job status monitoring.
Keywords: Denture Laboratory, Health Information Management, Service Monitoring, Job Requests, Health Information System.

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1. Introduction

Dental prosthesis laboratory services play an essential role in dental clinical care as they contribute to the production of prosthetic devices required by patients [1]. To ensure that the results meet clinical requirements and are completed on time, laboratories require clear and comprehensive information, such as patient data, type of work, specifications from the dentist, and the stages of the production process [2]. If such information is not properly managed, delays may occur, work status becomes difficult to monitor, and the final results risk being inconsistent with clinical needs [3].

At Quality Dental Care Semarang, the management of laboratory work requests and service process documentation is still conducted manually [4]. This approach can lead to several issues, including difficulties in retrieving data, lack of consistent monitoring of work status, and poorly organized recording of job start and completion times. Manual medical record management also presents various limitations, such as the risk of data loss, potential errors in recording, limited access to medical information, and obstacles in performing fast and accurate data processing and analysis [5].

Currently, healthcare services demand faster, more organized, and traceable workflows. Manual documentation requires more time and tends to show greater variability in recording processes compared to electronic systems, which can reduce efficiency and data accuracy [6]. Therefore, an information system can serve as a solution to assist laboratories in managing work requests and monitoring service processes in a more structured manner. A system tailored to laboratory needs can facilitate request recording, work status monitoring, completion time tracking, and report generation [7]. Thus, this study is important to develop an

information system for managing work requests and monitoring dental prosthesis laboratory services at Quality Dental Care Semarang to improve information management effectiveness and service quality [8].

The development of such an information system requires a platform that is easy to implement, cost effective, and suitable for the operational needs of clinic scale healthcare facilities. The use of web based technology utilizing PHP and HTML with a MySQL database managed through PHPMyAdmin is chosen because it is lightweight, relatively easy to develop, and can operate on simple technological infrastructure [9]. This approach allows the system to be accessed through a local network without requiring complex hardware and software investments. PHP programming language and MySQL database are widely used in developing web based healthcare information systems due to their capability in managing structured data and operating within relatively simple infrastructures [10].

In addition to ease of implementation, the use of PHP and MySQL also supports structured, secure, and easily updatable data management according to user needs. A web based system facilitates the recording of work requests, monitoring of service process status, and storage of laboratory work history in an integrated database [11]. Therefore, the development of this system is expected to provide a practical and applicable solution for the Quality Dental Care Semarang laboratory in improving the organization of information management .

This study addresses that gap by developing a web based information system specifically tailored to the operational workflow of the dental prosthesis laboratory at Quality Dental Care Semarang. The proposed system integrates electronic work request submission, patient and dentist information management, real time production status monitoring, turnaround time recording, audit logging, and automated reporting within a single platform. Unlike previous systems, this study emphasizes end to end workflow management from work request creation to delivery confirmation while supporting operational monitoring and managerial decision making [12].

Therefore, this study aims to develop and implement a web based information system for managing work requests and monitoring dental prosthesis laboratory services at Quality Dental Care Semarang. The proposed system is expected to improve workflow efficiency, strengthen information traceability, reduce service delays, and enhance the quality of laboratory information management [13].

2. Methods

The system design method used in this study is Rapid Application Development (RAD), an approach to system development that emphasizes speed through iterative prototyping and early user involvement. RAD was chosen because it is suitable for developing small to medium scale information systems in clinical environments, where system requirements need to be implemented quickly and refined gradually based on user feedback.

The Rapid Application Development (RAD) method is applied in developing the laboratory information system due to its iterative and rapid approach, as well as its direct user involvement to ensure that the resulting system aligns with the operational needs of the laboratory [14]. The stages of RAD in this study include requirements analysis, prototype design, system development, and testing and refinement. In the requirements analysis stage, the researcher identifies user needs through observation and interviews with laboratory staff regarding the management of work requests and service monitoring. The prototype design stage involves developing process flows, interface designs, and database structures as an initial representation of the system. Subsequently, the system development stage is carried out by implementing the prototype using web based technologies [15]. Based on the identified requirements, an initial prototype consisting of process flows, interface designs, and database structures was developed and evaluated by

representative users. Feedback obtained during each evaluation cycle was used to refine the prototype before implementation. The system was developed using PHP, HTML, CSS, JavaScript, and MySQL with PHPMyAdmin, and implemented iteratively until all functional requirements were fulfilled. Development was carried out using a computer with an Intel Core i5 processor, 8 GB RAM, Windows 11, Visual Studio Code, XAMPP, Apache, PHP 8.x, and MySQL 8.x.

3. Result and Discussion

Design of a Work Request Management and Monitoring System for Dental Prosthesis Laboratory Services

The design of the Work Request Management and Monitoring System for Dental Prosthesis Laboratory Services aims to create a digital solution capable of managing work requests, monitoring process status, and generating laboratory performance reports in a more efficient, structured, and accessible manner.

Use Case Diagram

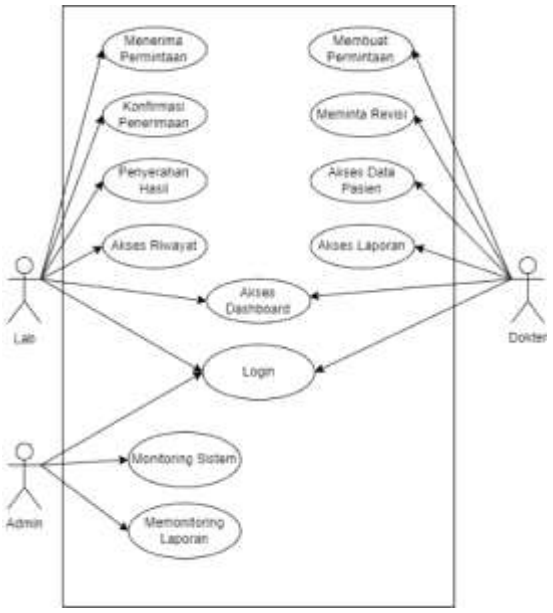

Figure 1. Use Case Diagram

Figure 1 illustrates the interaction between two main actors in the information system for managing work requests and monitoring dental prosthesis laboratory services at Quality Dental Care Semarang, namely the Doctor and the Laboratory Admin. The Doctor plays a role in creating work requests related to the fabrication of dental prostheses or other treatments, as well as monitoring the status of submitted tasks. Doctors can access information regarding work progress and receive notifications when the tasks are completed.

On the other hand, the Laboratory Admin is responsible for receiving and managing work requests, updating the status of ongoing tasks, and managing patient data associated with those tasks [16]. The Admin also has access to schedule work processes, manage structured data, and generate service reports. This system ensures that the workflow in the dental prosthesis laboratory becomes more efficient by facilitating the monitoring of work status and ensuring more organized and structured patient data management.

System Design

1. Login Page

Figure 2. Login Page

Figure 2 illustrates the Login Page of the Quality Dental Care system, which is designed to allow access for three main types of users: Admin, Laboratory Staff (Lab), and Doctor. At the top of the page, there is a tooth shaped logo indicating that the system is intended for dental clinic use. The page title reads "Quality Dental Care," followed by the subtitle "Laboratory Management System," which describes the system's functionality.

Users are required to enter a Username and Password in the two provided input fields. These fields are labeled "Enter username" and "Enter password," making it easier for users to understand the required information. After filling in the required fields, users can click the blue "Login" button at the bottom to access the system. Only users with valid credentials as Admin, Laboratory Staff, or Doctor are granted access. The page design is dominated by a blue color scheme, giving a professional and clean impression.

2. Admin Dashboard Page

Figure 3. Dashboard – Admin

Figure 3 presents the Admin Dashboard, which is designed to provide a quick overview of laboratory work status. At the top, a greeting message displays "Welcome, Administrator." The dashboard is divided into several sections with visual indicators representing the number of work requests, ongoing tasks, completed tasks, and delayed tasks. Each category is color coded: blue for Today's Requests, orange for In Process, green for Completed Today, and red for Delayed.

Below, there is a "Recent Jobs" list displaying key information such as request number, patient name, type of work (e.g., "Bridge"), job status (e.g., "Delivered"), and request creation date. This table allows the Admin to easily monitor the latest job requests. The Admin can also access more detailed information by clicking the "Detail" button next to each job. Overall, this dashboard supports real time monitoring and ensures efficiency and organization in managing work requests.

3. User Management Page

Figure 4. User Management – Admin

Figure 4 shows the User Management page, where the Admin can view a list of registered users, including information such as username, full name, role, email, active status, and last login time. Each

user has a status indicating whether the account is active, displayed in the Status column. The table shows three accounts: admin, lab001 (Lab Staff 1), and dokter001 (Dr. Ahmad), each with different roles, namely ADMIN, LAB_STAFF, and CLINIC.

In the Action column, the Admin can perform actions such as Edit to modify user information, Reset Password to reset user credentials, and Delete to remove user accounts from the system. At the top of the page, there is an "Add User" button that allows the Admin to add new users. This system is designed to facilitate user account management and access control within the clinical environment.

4. Master Data Page

Figure 5. Master Data – Admin

Figure 5 illustrates the Master Data page, where the Admin can manage data related to patients, clinic units/doctors, and job types. There are three tabs at the top of the page: Patients, Clinic Unit/Doctor, and Job Types, allowing the Admin to manage each category accordingly. Each entry in the table contains essential patient information, along with an Edit button on the right side of each entry for updating data. The Admin can also add new patients by clicking the "Add Patient" button located at the top right corner of the page. This page enables efficient management and updating of patient data, clinic units, and laboratory job types.

5. Audit Log Page

Figure 6. Audit Log – Admin

Figure 6 presents the Audit Log page, which allows the Admin to monitor and record system activity history, including user login and logout events. At the top of the page, there are filters to sort data based on User, Action, Table, and Date range. The Admin can select specific criteria to search for particular activities, such as login or logout events on a certain date or for a specific user.

At the bottom of the page, the System Activity History is displayed, showing details such as timestamp, user, action performed, affected table, and activity description. This feature enables the Admin to comprehensively monitor system activities, ensuring data security and transparency.

6. Laboratory Dashboard Page

Figure 7. Dashboard – Lab

Figure 7 shows the Laboratory Dashboard, which provides a concise overview of job statuses managed by laboratory staff. At the top, several indicators display the number of jobs in different categories: New, Diversification, In Process, Revision, Delivered, Completed, and Delayed, each distinguished by different colors.

For example, the New and Diversification indicators show a value of 0, indicating no new or diversification stage jobs. Meanwhile, the Delivered indicator shows a value of 1, indicating one job has been delivered. The Revision and Delayed indicators also show 0, meaning no jobs are under revision or delayed. This page provides a clear overview for laboratory staff regarding workflow, with intuitive color coding to facilitate efficient monitoring.

7. Work Request List Page

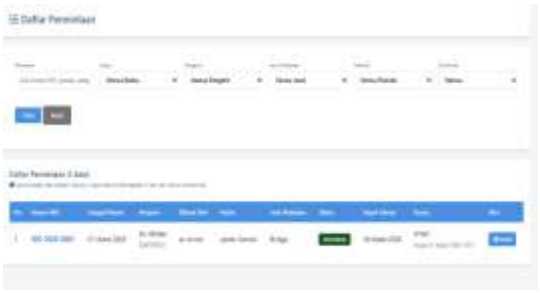

Figure 8. Work Request List – Lab

Figure 8 illustrates the Work Request List page, which allows laboratory staff to monitor all incoming job requests within the system. Various search filters are available to refine data based on criteria such as Work Order Number, Status, Sender, Job Type, Period, and Delay status. Users can select relevant criteria and click the “Filter” button to display matching data, or use the “Reset” button to return to the default view.

Below the filter section, a table displays a comprehensive list of work requests along with relevant job information. This page enables laboratory staff to efficiently manage and monitor the status of each job, as well as perform further actions such as viewing detailed job information.

8. Result Submission Page

Figure 9. Result Submission – Lab

Figure 9 illustrates the Result Submission page, which displays a list of completed jobs that have not yet been delivered to the doctor or clinic. There are two main categories: Not Yet Delivered and Delivered. In the Not Yet Delivered category, if there are no jobs awaiting submission, the page will display the message “No items awaiting delivery.”

This page is designed to assist laboratory staff in monitoring completed jobs that are pending delivery to doctors or clinics. Once a job has been delivered, it is marked accordingly. This feature enables staff to efficiently manage and track jobs that are ready for submission.

9. Status History Page

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Figure 10. Status History – Lab

Figure 10 presents the Status History page, which allows staff to monitor changes in job status within the system. At the top of the page, filters are available to refine data based on Period, Status, and Work Order Number, enabling users to search for specific status changes within a certain time range or category.

Below, the Status Change History table displays a list of jobs along with their previous and updated statuses, such as Delivered, Completed, In Process, and Diversification. Each entry includes the timestamp of the change, the user who made the update, and any related notes. This page provides an efficient way to track and manage job status changes in detail, ensuring that all processes follow established procedures.

10. Doctor Dashboard Page

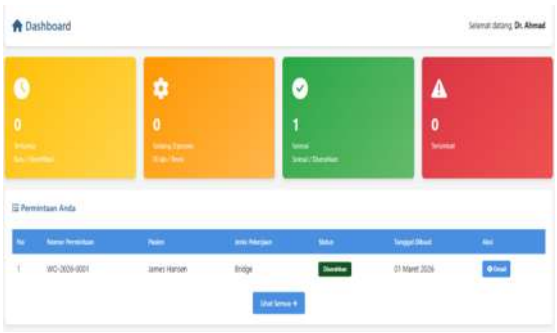

Figure 11. Dashboard – Doctor

Figure 11 shows the Doctor Dashboard, which provides a summary of job statuses related to the doctor's requests. There are four status indicators: Pending, In Process, Completed, and Delayed, each represented by a distinct color. Below, the "Your Requests" table displays submitted jobs, including information such as Request Number, Patient, Job Type, Status, and Creation Date. This page allows doctors to easily monitor ongoing work and access detailed information through the provided "Detail" button.

11. Create Request Page

Figure 12. Create Request – Doctor

Figure 12 illustrates the Create Request page, which is designed to allow doctors or staff to submit new job requests to the laboratory. In the Patient Data section, users are required to specify whether the patient is an existing or new patient. If selecting an existing patient, users can choose from the available list; if selecting a new patient, they must input the patient's information.

In the Request Data section, users must select the sender (doctor or clinic unit), specify the job type, and set a Target Completion Date using the defined date format. Users can also assign a priority level (Normal, Urgent, etc.) and provide a Job Description detailing the required specifications. An optional Notes field is available for additional information. After completing all required fields, users can save the request by clicking the "Save Request" button or cancel the process using the "Cancel" button.

12. Request List Page

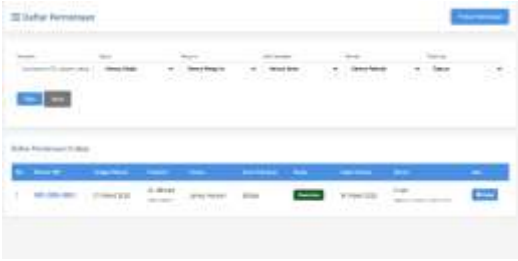

Figure 13. Request List – Doctor

Figure 13 shows the Request List page, which enables users to view job requests and filter data based on various criteria such as Work Order Number, Status, Sender, Job Type, Period, and Delay status. Users can apply filters using the "Filter" button or reset them using the "Reset" button.

Below, a table displays the list of job requests with key information including Work Order Number, Submission Date, Sender, Job Type, Status, Target Completion, Duration, and a "Detail" button for further information. This page supports efficient monitoring and management of job requests.

13. Patient Data Page

Figure 14. Patient Data – Doctor

Figure 14 presents the Patient Data page, which allows users to search and view information about registered patients. At the top, a search field enables users to find patients based on Name, National ID (NIK), or Phone Number. Users can click "Search" to find specific data or "Reset" to display all patient records.

Below, the Patient List table displays detailed information such as Name, ID Number, Date of Birth, Phone Number, Number of Requests, Last Request, and a "Detail & History" button to view further information and request history. This page provides an efficient way to manage patient data and track related activities.

14. Report Page

Figure 15. Report – Doctor

Figure 15 illustrates the Report page, which provides a summary of job request statuses within a selected period. Several indicators display the number of requests across categories such as Total Requests, Pending, In Process, Completed, and Delayed. Each category is color coded: blue for total requests, yellow for pending, orange for in process, green for completed, and red for delayed.
Below, the Service Type Summary presents the types of jobs performed along with the number of requests for each service. The Request List table provides detailed information for each request, including Work Order Number, Date, Patient, Job Type, Status, and Target Completion. Users can also download the report in CSV format using the "Download CSV" button located at the top right corner of the page. This page helps users monitor and analyze job request performance over a specific period.

Black Box Testing Results

The results of black box testing on the Dental Care system indicate that all system functionalities operate as expected and are capable of handling various types of input appropriately. In the first scenario, login testing using the name "Dr. Ahmad" with the Doctor role was successful, with access granted according to the selected role. Similarly, login testing with the Laboratory Admin role also successfully provided appropriate access, ensuring that user authorization is handled correctly. In addition, testing the addition of new patient data, such as a patient named "James," demonstrated that the system correctly stored the data without errors. Users were able to add new patients smoothly, and the data appeared in the patient list accessible to laboratory staff [17].

Testing related to job types was also successful, with newly entered job data (such as crown work) properly recorded in the system and displayed according to the specified target date, namely April 15, 2026. Testing the transition of job status from "New" to "Diversification" and from "Diversification" to "In Process" showed that the system is capable of updating job statuses correctly and in the intended sequence. All job statuses are recorded systematically, enabling users to easily monitor work progress. Furthermore, system validation successfully identified invalid input, such as entering a target date earlier than the current date. The system automatically displayed an error message and prevented incorrect data entry.

Additionally, testing of patient data deletion functioned properly. Patient data removed from the system was completely deleted without leaving any unintended traces. The recorded job status history could also be displayed correctly, showing the proper sequence of statuses from "New" to "Completed/Delivered." Overall, these testing results demonstrate that the system performs effectively in managing patient data, job data, and job status, while handling various user inputs accurately and producing expected outcomes [18].

The implementation of the web based inventory information system significantly improved inventory management practices at Toko Spare Part Jaya Muncul compared with the previous manual system. Before implementation, inventory records were maintained using notebooks and spreadsheet files, resulting in frequent discrepancies between recorded and actual stock levels, lengthy report preparation, and purchasing decisions that relied primarily on subjective estimation. These conditions often caused stock shortages for fast moving products and excessive inventory for slow moving items.

Following implementation, inventory data, purchase transactions, sales transactions, and reporting processes became centralized within a single web based platform. The automation of data recording reduced duplicate entries and minimized human recording errors, while real time inventory updates enabled users to monitor stock availability more efficiently. Consequently, report generation became faster because financial, inventory, EOQ, and transaction reports could be generated automatically without requiring manual data compilation. These improvements increased operational efficiency and enhanced responsiveness in monitoring inventory conditions .

The developed system integrates several inventory management features that directly address the problems identified during the needs analysis. The EOQ module automatically calculates the optimal purchasing quantity based on demand, ordering costs, and holding costs, replacing estimation based purchasing decisions with objective and measurable recommendations. This feature supports more consistent purchasing decisions while reducing the potential for overstocking and stock shortages.

The Safety Stock and Reorder Point (ROP) modules complement EOQ by determining the minimum inventory level required to maintain product availability during supplier lead time. These features provide early warnings regarding replenishment timing, allowing users to initiate purchase orders before stock reaches critical levels.

In addition, the integration of the Simple Moving Average (SMA) forecasting method enables purchasing recommendations to be based on historical demand patterns instead of intuition alone. The combination of EOQ, Safety Stock, ROP, and SMA transforms the system from a conventional inventory recording application into a comprehensive decision support system for inventory planning.

System functionality testing demonstrated that all major system features operated successfully according to the predefined functional requirements. Black Box Testing confirmed that processes including authentication, inventory management, purchase and sales transactions, report generation, and EOQ calculations functioned correctly without functional failures. These results indicate that the developed system satisfies its functional specifications and is suitable for operational deployment. The User Acceptance Test (UAT) further demonstrated a high level of user satisfaction. The overall acceptance score reached 89.97%, categorized as Very Good, indicating that users considered the system useful, easy to operate, and suitable for supporting daily inventory management activities. More specifically, interface satisfaction reached 91.4%, information quality satisfaction 89.5%, and system functionality satisfaction 89.0%, showing consistently positive evaluations across all assessment dimensions. These findings suggest that users accepted not only the usability of the system but also the practical value of the integrated inventory management functions in supporting operational decision making.

The findings of this study are consistent with previous research demonstrating that web based inventory management systems improve operational efficiency, reduce manual recording errors, and enhance inventory monitoring accuracy. Likewise, previous studies on the Economic Order Quantity (EOQ) method have shown that automated order quantity calculations contribute to more effective purchasing decisions and lower inventory related costs. However, this study offers several distinguishing contributions. Unlike many previous systems that implemented only a single inventory control method or focused solely on inventory digitization, the proposed system integrates EOQ, Safety Stock, Reorder Point (ROP), and Simple Moving Average (SMA) forecasting within a unified web based decision support platform. This integration enables users not only to manage inventory records but also to obtain comprehensive purchasing recommendations, determine optimal reorder timing, anticipate future demand, and maintain appropriate safety stock levels. As a result, the developed system provides more comprehensive support for inventory planning and purchasing decisions than conventional inventory management applications.

4. Conclusion

The results of testing and implementation of the Dental Care system indicate that the system successfully manages work requests and monitors dental prosthesis laboratory services at Quality Dental Care Semarang efficiently. The system supports patient data management, including recording, updating, and deleting data, as well as managing work requests such as denture fabrication with detailed completion targets, priorities, and real time status updates. Black box testing results show that the system can handle various user

inputs with proper validation, manage role based login, and update job status accurately. With integrated job status monitoring and reporting features, the system improves efficiency, accuracy, and transparency in managing laboratory data and operations, while also supporting better decision making in laboratory healthcare services.

For future research, it is recommended to develop integration between the Dental Care system and other systems such as Electronic Medical Records (EMR) and Clinic Management Systems to enhance the integration of patient data and laboratory workflows. This development may also include improving data security through encryption and multi factor authentication. Another focus is enhancing the user interface (UI) and user experience (UX) to facilitate accessibility for non technical users, as well as analyzing the system's impact on service quality, such as job completion time and patient satisfaction. Load testing to ensure system stability at a larger scale is also highly recommended to guarantee the system's sustainability in the future.

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