Enhancing Security and Land Protection Department at PT XYZ Through A Digitalized Reporting System

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Abstract. The Security and Land Protection Department at PT XYZ is dedicated to ensuring the safety, security, and compliance of the company's operations and assets. The department has embarked on digitalizing its reporting system, transitioning from the traditional paper-based methods to a technology-driven approach. A digitalization reporting system was developed using MySQL, Express, React, and Node.js to enhance the efficiency and effectiveness of reporting processes in the Department of Security and Land Protection. By leveraging these technologies, the system provides a user-friendly interface for creating, managing, and accessing reports, ensuring timely information exchange across the department. The integration of MySQL enables secure and scalable data storage, while Express and Node.js facilitate seamless communication between the front-end and back-end components. React ensures a responsive and interactive user experience, enabling intuitive navigation and data visualization. Ultimately, this digitalization reporting system empowers the Security and Land Protection Department to streamline reporting workflows, enhancing operational capabilities and performance.

Keywords: *Digitalization Reporting System, Security and Land Protection Department, MERN Stack*

1 Introduction

PT XYZ, a prominent coal mining company in Indonesia, aims to enhance its Security and Land Protection Department by implementing a digital reporting system. Currently faced challenges with a paper-based reporting process, the department seeks to improve efficiency and data accessibility. By transitioning to a digital system, time-consuming tasks associated with paper reports can be eliminated, thus enabling faster creation, submission, and review of reports. The digital system also facilitates secure storage and easy retrieval of documents, reducing the risk of loss. With a focus on tailored features such as comprehensive report lists, submission tracking, and automated notifications, the department can streamline workflows, reduce paper usage, and enhance operational efficiency.

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2 Literature Review

The utilization of technology and cutting-edge solutions has become increasingly important in various industries to enhance efficiency, decision-making, and operational processes. This literature review explores different applications of technology in diverse sectors, including the mining industry, hotel management, emergency response in educational institutions, and animal welfare.

Choudhary [1] discusses the implementation of a Business Intelligence (BI) system for a local mining company. The author emphasizes the need for quick, efficient, and automated reporting of mining data to fulfill the requirements of government agencies, domestic investors, international investors, and other relevant institutions. The proposed solution involves the use of a Data Warehouse with IN-MEMORY OLAP capabilities for structured storage, real-time data analysis, and high-speed data processing and visualization.

In the context of the mining industry, [2] investigates the implementation of Industry 4.0 technologies to bridge the gap between enterprise-level and shop floor systems. The author highlights the significance of real-time information flow in enabling effective decision-making and achieving optimum operational performance. The study demonstrates the integration of business systems, manufacturing systems, and processes using Industry 4.0 technologies. The results showcase the creation of a semi-smart mine with real-time visibility into overall mining operations.

Another [3] focuses on the development of an online hotel reservation system in Sri Lanka using advanced technologies. The author emphasizes the importance of an efficient hotel management system that enables correct operation, room reservations, and reduces paperwork. The study presents a prototype built using MongoDB, Express.js, React.js, and Node.js (MERN stack) to showcase the system's functionalities from both client and administrator perspectives. The MERN stack is highlighted as a suitable choice for developing high-quality web applications with superior performance and customized features.

NU READY is proposed [4] as a web and mobile application framework for school emergency response, with a focus on the National University - Manila. The framework aims to assist educational institutions in disaster preparedness by providing information about disasters and emergency-related modules for students and employees. The mobile application enables reporting of accidents and hazards, allowing timely communication with the appropriate authorities responsible within the campus.

Addressing animal welfare, Khubchandani et al. [5] presents an emergency reporting system for animals. The study introduces a web-based solution that allows individuals to register animal-related complaints, which are then categorized using Natural Language Processing (NLP) techniques based on various factors. The categorized complaints are then shared with nearby non-governmental organizations, veterinarians, animal hospitals, shelters, and other relevant agencies for prompt response and assistance.

In summary, the reviewed literature highlights the significance of technology in diverse domains. The applications range from business intelligence systems for mining companies and the implementation of Industry 4.0 technologies in the mining industry to the development of online hotel reservation systems, emergency response frameworks for educational institutions, and emergency reporting systems for animals.

These technological advancements aim to enhance efficiency, decision making, and overall operations in their respective fields.

3 Research Methodology

3.1 Software Development Life Cycle Waterfall Methodology

The SDLC (Software Development Life Cycle) waterfall methodology is a linear approach to software development that follows a sequential progression through a set of phases. Each phase in the process must be completed before the next phase can begin, with a focus on strict control of the project scope and the deliverables of each phase.

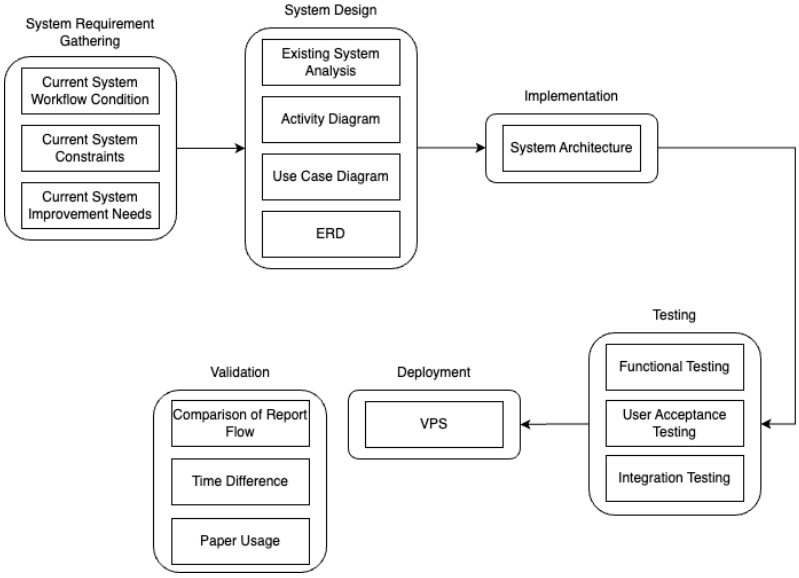

Fig. 1. SDLC Waterfall Methodology

As shown in Fig. 1, the waterfall methodology serves as the foundation for this thesis, providing a structured approach to software development which encompasses system requirement gathering, system design, implementation, testing, and deployment. The initial stage of system requirement gathering involves analyzing the current system workflow, identifying existing system constraints, and determining areas for improvement. The subsequent system design phase incorporates elements such as existing system analysis, activity diagrams, use case diagrams, and entity relationship diagrams to ensure a comprehensive understanding of the software architecture. Moving forward, the implementation phase focuses on developing a robust system architecture that aligns with the established requirements and design specifications. Thorough testing methodologies, including functional testing, user acceptance testing, and integration testing, are employed to verify the system's reliability and performance. Finally, the deployment stage encompasses the utilization of a Virtual Private Server (VPS) environment to ensure a seamless transition from development to production.

3.2 System Requirements Gathering

The manual reporting system which utilizes paper has several constraints that impact its efficiency and effectiveness. Firstly, accessibility is limited as physical paper reports are stored in filing cabinets or folders, making it challenging to access and retrieve information quickly. Secondly, the time required to create, distribute, and process paper reports is significantly longer compared to digital systems. This time-consuming process can result in delays and inefficiencies in obtaining data. Additionally, the manual reporting system leads to a longer report workflow. This extended workflow can result in delays and inefficiencies.

The current system is in need of improvement through the implementation of a digital reporting system. The manual paper-based reporting system is plagued by inefficiencies and limitations that hinder productivity and performance. By adopting a digital reporting system, the organization can streamline the reporting process, eliminating the need for physical paperwork and reducing time consuming tasks such as manual data entry and report distribution.

3.3 System Design

Analysis of Existing System

Analysis of Duties and Authorities of the Security and Land Protection Department

The duties and authorities associated with security and land protection are essential for ensuring the safety and security of employees and assets within the company. The designated security team or manager is responsible for implementing security measures in all operational areas, carrying out security system investigation and evaluation activities, and stopping any activity identified as unsafe. They have the authority to assess security risks, develop policies and procedures, train employees, and enforce security measures. All employees have a responsibility to report unsafe activities to their supervisor or safety officer, who has the authority to stop the unsafe activity and take corrective action. Additionally, the department head or manager is responsible for ensuring the availability of progress reports, which may involve delegating tasks and responsibilities to team members. Overall, these duties and authorities are critical for maintaining a secure work environment and protecting company assets from harm.

Analysis of the Common Issues Faced by the Security and Land Protection Department

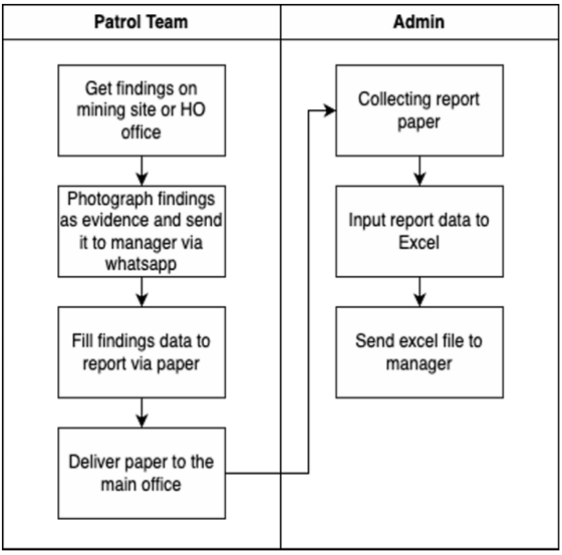

Fig. 2. Current Workflow

As seen in Fig. 2, the patrol team of the security and land protection department is still reliant on a manual system that involves reporting findings on paper. This outdated approach has resulted in inefficiency and time consumption, causing the reporting process to take a longer time. Consequently, multiple administrators are required to review the reports, which creates delays. Furthermore, the administrators continue to use manual methods for inputting data, requiring them to collect paper reports and re-enter them into Excel. This elongated reporting process is inefficient and affects the department's performance.

Activity Diagram

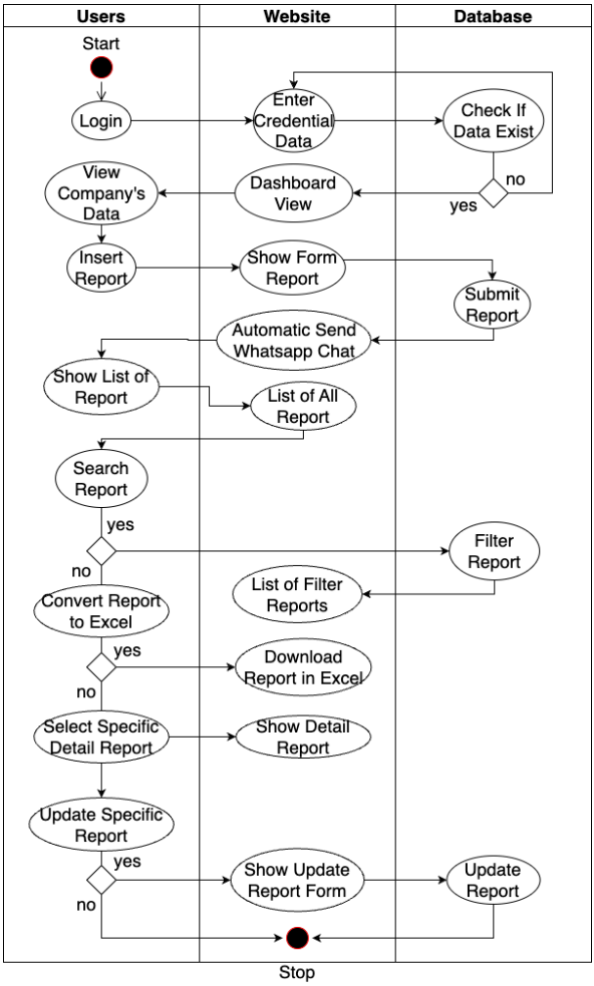

Fig. 3. Activity Diagram

As seen in Fig. 3, users are initially directed to the login page where the system authenticates their data by cross-referencing the entered credentials with the database. Upon successful verification, users are redirected to the dashboard page where they can view departmental data. Users can also create reports on the report page, and once submitted, the report data is automatically saved in the database. After that, the WhatsApp message is sent to the manager for review and necessary action. Furthermore, users can view a list of previously created reports on the list report page. On the list report page, there is a search report feature to display the list of reports according to the input. In addition, users can also convert reports into excel files. Next, the user can see the details of each report through the report details modal. Finally, the user can update the report through the update report modal if there is an error in the input.

Use Case Diagram

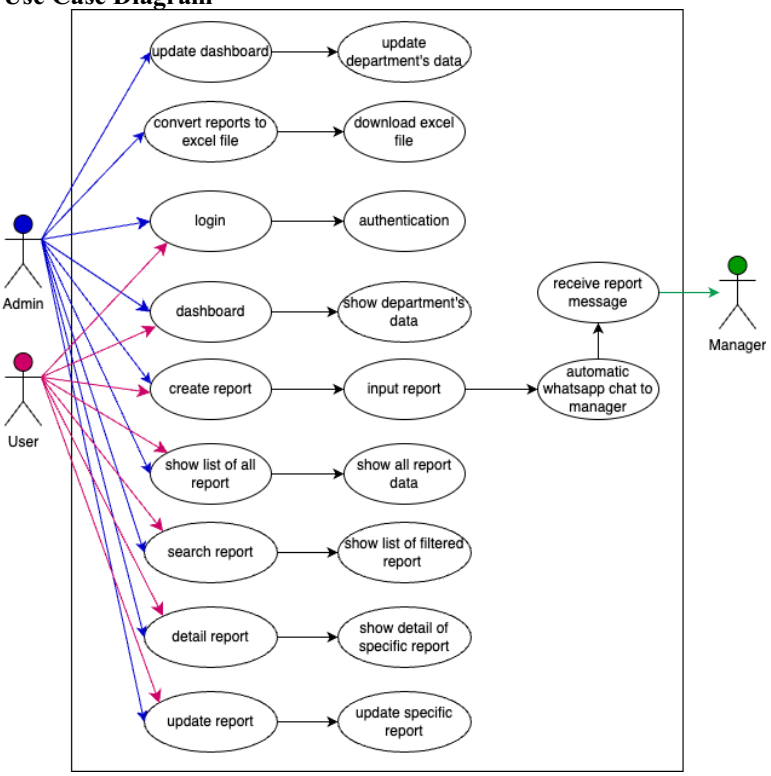

Fig. 4. Use Case Diagram

According to Fig. 4, the user can be assigned one of two roles, namely *user* and *admin*. Most of the features can be accessed by each role, but there are some features that can only be accessed by the admin. Both roles log in to the web platform by using their given credentials, then they are presented with a website dashboard that displays departmental data. Then, they can create customized reports according to their needs. Upon completion of the report, an automated WhatsApp message is sent to the manager for oversight of the team report. Both roles can access the report list from the pre-created report consisting of the general section report data. On this page, both roles can also view the details of each report and can update the report if there are errors in reporting. In addition, both roles can filter and search reports based on various criteria, such as date, shift, or location to find the desired information. Especially for the admin role, they can convert the report list into an excel file and they can also update the department data on the dashboard page.

Entity Relationship Diagram

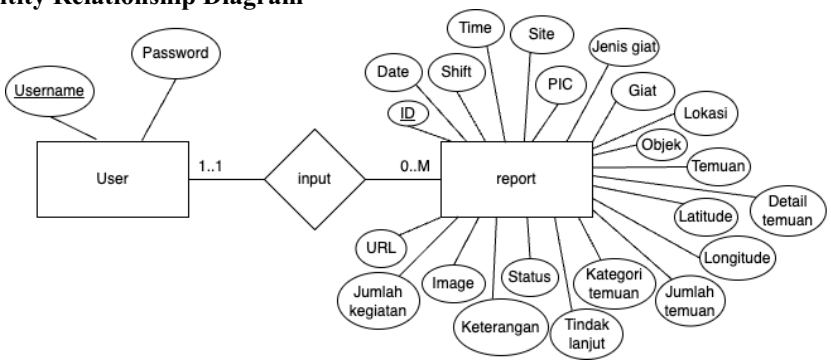

Fig. 5. Entity Relationship Diagram

Fig. 5 shows the Entity Relationship Diagram (ERD), which illustrates two entities involved in the system, namely *users* and *reports*. Each entity has its own attributes that can be used to describe the characteristics of that entity. In addition to the attributes, this diagram also shows the cardinality of the relationship between the two entities. In this case, the relationship between users and reports is one-to-many. This means that one user can create many reports, but one report can only be created by one user.

Implementation

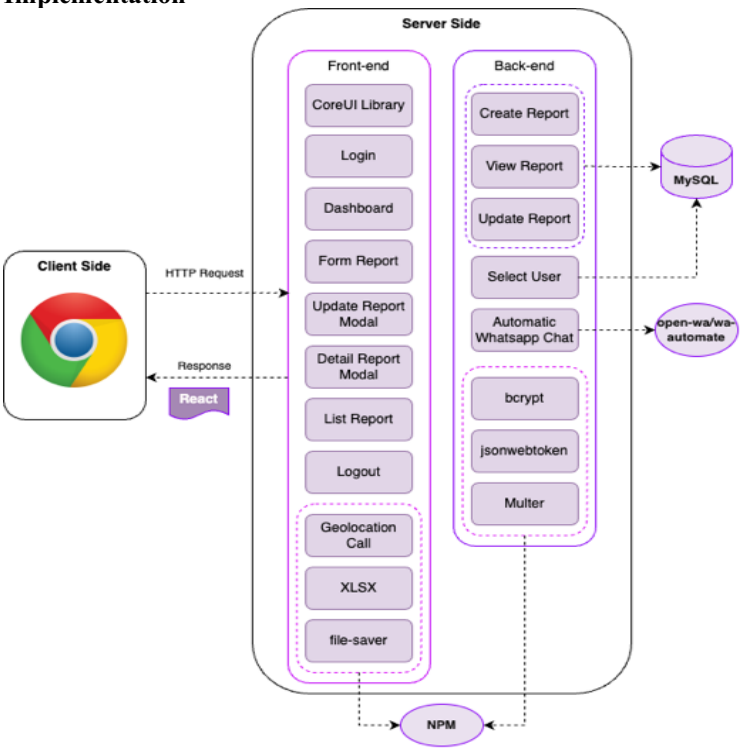

Fig. 6. System Architecture

As seen in Fig. 6, the frontend is built using React and a core UI library. React is a popular JavaScript library used for building user interfaces, and it allows developers to create reusable UI components. The core UI library provides pre-built components and styling for use throughout the application. These pages are used to display and interact with data stored in the backend. The frontend also makes use of several NPM packages, including a geolocation call package, an xlsx package, and a file-saver package. The geolocation package allows the application to retrieve the user's current location, while the xlsx and file-saver packages enable the application to export data as Excel files and save files locally, respectively. The backend of the application is built using Node. The backend of the application includes several APIs that allow users to create, view, and update reports. These APIs likely interact with a MySQL database to store and retrieve data.

Testing

Functional Testing

In this testing phase, the system's functionalities are thoroughly evaluated to validate that they meet the intended requirements and perform as expected. The testing process involves assessing various functionalities, such as user authentication and authorization, report creation and editing, data retrieval and filtering, WhatsApp chat notification, and converting list report to Excel file. By conducting comprehensive functional tests, potential issues like bugs, data inconsistencies, or usability flaws can be identified and rectified before the system is deployed, thus enhancing its overall quality.

Integration Testing

During integration testing, the primary focus is to examine the seamless collaboration and interaction between different components, such as the backend APIs, frontend user interface, database connectivity, and any external services. Through rigorous testing scenarios, integration testing ensures that all the modules and services integrate smoothly, data flows correctly between them, and the system functions as a unified entity. By verifying the compatibility of the deployed system on a VPS, integration testing guarantees that the digital report system operates reliably, providing accurate reports and meeting the expectations of users.

User Acceptance Testing

User Acceptance Testing (UAT) is tested in the "real world" by a target audience or company representatives. This type of testing is not intended to be menu-driven, but uses scenarios and data that represent real-world, on-site usage to ensure the application meets end-user requirements. It is intended to be run by users.

Deployment and Validation

VPS

In order to deploy the project to be accessible through the internet, a cloud VPS (Virtual Private Server) provided by idcloudhost was used. The cloud VPS referred to as *droplet* runs on two virtual CPUs as well as four gigabytes of RAM and 80GB of Boot Disk. By leveraging VPS for hosting the web application, it aims to ensure a reliable and secure deployment environment that can support the application's performance, scalability, and security requirements effectively.

Comparison Report Flow

Manual reporting involves gathering data manually through paper forms or spreadsheets, transferring it to a central repository. Web-based systems streamline the process by allowing data entry directly into an online interface, reducing errors and allowing immediate storage and retrieval. This enhances the overall reporting experience.

Time Difference

The manual reporting system was time-consuming and prone to delays, while the web based system revolutionized reporting efficiency. It streamlined report generation processes, reduced compiling and analyzing time, and allowed stakeholders to access and review reports instantly. This improved productivity and informed decisions were made by stakeholders.

Paper Usage

The digitalization of security and land protection management reporting systems has significantly reduced paper usage, reducing resource consumption and challenges in storage, organization, and retrieval. Web-based systems offer a sustainable, paperless solution, capturing, recording, and accessing critical data electronically, eliminating excessive paper consumption.

4 Result and Discussion

4.1 Testing Result and Validation

Functional Testing

Table 1. Functional Testing Result

No	System Features	Test Case	Result	Status
1.	Login & Logout	Input correct username and password	The application leads to the page dashboard	SUCCESS

No	System Features	Test Case	Result	Status
		Input false username and password	The application shows fail alert "Username atau Password salah"	SUCCESS
		Input route to pass through login page	The application stays on login page, need login first	SUCCESS
		Tap logout option	The application redirect to login page	SUCCESS
2.	Dashboard	Show dashboard chart information in pdf file	The application shows dashboard info in the form of a chart	SUCCESS
		Admin role update the dashboard chart through input file type	The application displays updated chart	SUCCESS
		User role cannot update dashboard chart information	The input file type not displayed	SUCCESS
3.	Report	Fill report form and upload a photo	The application redirect to list report page and the data successfully entered in database	SUCCESS
		Not fill one or several on certain section	The input element shows alert and the application cannot proceed to other report sections to be filled out.	SUCCESS
		Fill report form on action section	The application automatically fetch user's location (latitude and longitude)	SUCCESS
		Submit report	The application uses WhatsApp chat bot to send broadcast messages from reports submitted by users to managers or several people in charge.	SUCCESS
4.	List report	View list of reports that have been created previously	The application shows list of reports that have been created previously by users	SUCCESS

No	System Features	Test Case	Result	Status
		Input keywords to filter report by search feature	The application shows a list of reports that match the keywords inputted by the user.	SUCCESS
		Admin role clicks on convert button and download the file	The application converts the list of report into excel file and store them locally	SUCCESS
		User role cannot convert to excel file	The application not show convert button for user role	SUCCESS
		Select detail report on report option icon in list report page	The application shows detail report modal according to the selected report	SUCCESS
		Update report on report option icon in list report page	The application shows update report modal according to the selected report and update the data on database according to data entered by the user	SUCCESS

Table 1 shows the result of Functional testing. As seen from the table, the application passes the Functional test.

Integration Testing

Table 2. Integration Testing Result

No	System Feature	Test Case	Result
1.	Login Admin	Login valid credential	SUCCESS
2.	Login Admin	Login invalid credential	SUCCESS
3.	Login User	Login valid credential	SUCCESS
4.	Login User	Login invalid credential	SUCCESS
5.	Logout Admin	Logout	SUCCESS
6.	Logout User	Logout	SUCCESS
7.	View Dashboard	Show pdf file	SUCCESS

No	System Feature	Test Case	Result
8.	Update Dashboard	Update pdf file	SUCCESS
9.	Insert Report	Fill all report form	SUCCESS
10.	Insert Report	Fill incomplete report form	SUCCESS
11.	Submit Report	Save to database	SUCCESS
12.	WhatsApp chat	Send WhatsApp chat automatically	SUCCESS
13.	Fetch Location	Retrieve location (latitude and longitude)	SUCCESS
14.	View List Report	Retrieve report	SUCCESS
15.	Search Report	Filter report based on the search	SUCCESS
16.	Convert Report	Download report in excel	SUCCESS
17.	View Detail Report	Show detail report modal	SUCCESS
18.	View Update Report	Show update report modal	SUCCESS
19.	Update Report	Update report	SUCCESS

Table 2 shows the result of Integration testing. As seen from the table, the application passes the Integration test.

User Acceptance Testing

Table 3. User Acceptance Testing Result

System Features	Result
Login	All is accepted
Logout	All is accepted
View Dashboard	All is accepted
Update Dashboard	All is accepted
Create Report	All is accepted
Send WhatsApp Chat	All is accepted
View List Report	All is accepted
View Detail Report	All is accepted
Update Report	All is accepted
Convert Report	All is accepted
Filter Report	All is accepted

The User Acceptance test was held on May 17, 2023. The test results show in Table 3 that the system has met all the set requirements.

Comparison of Report Flow

The previous flow, which involves manual reporting process, is depicted in Fig. 7.

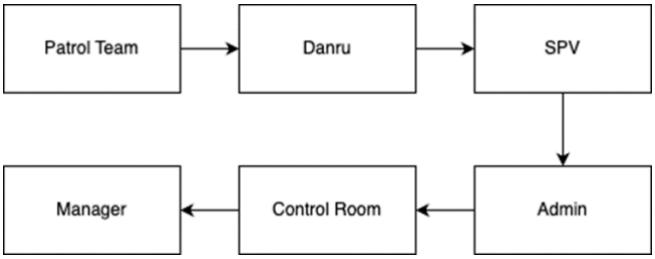

Fig. 7. Previous Workflow

As seen on Fig. 7, the reporting system workflow within the organization followed a manual process. Data collection involved manuals, which often led to errors and inconsistencies. Report generation required significant time and effort, as data had to be compiled, formatted, and analyzed based on paper. Overall, the reporting system workflow was prone to delays, inefficiencies, and limited accessibility. The new workflow that solves these problems is shown in Fig. 8.

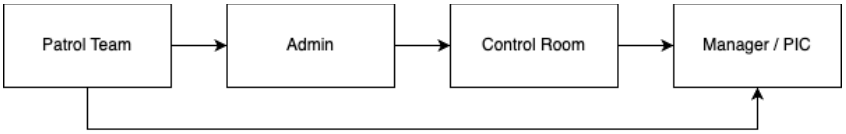

Fig. 8. Current Workflow

As seen in Fig. 8, a transformative shift occurred in the reporting system workflow. The web-based interface allowed users to access and input reports, from anywhere and from any device. As a result, the web-based reporting system significantly improved the overall efficiency, accuracy, and accessibility of the reporting system workflow and data.

Time Difference

Table 4. Time Difference

Mining Site	Reporting Time		Difference
	Before	After	
BMO 1	120 mins	5-10 mins	110-115 mins
BMO 2	70 mins	5-10 mins	60-65 mins
GMO	50 mins	5-10 mins	40-45 mins
HO	30 mins	5-10 mins	20-25 mins

Mining Site	Reporting Time		Difference
	Before	After	
LMO	60 mins	5-10 mins	50-55 mins
PMO	45 mins	5-10 mins	35-40 mins
SMO	40 mins	5-10 mins	30-35 mins
SUARAN	90 mins	5-10 mins	80-85 mins

Table 4 illustrates the difference in time before and after using the created website. Previously using a manual system, users were required to physically transport paper reports to the HO for further action, resulting in prolonged processing time and varying distances between the HO and each site. However, the implementation of a digital reporting system has significantly expedited the reporting process by enabling online submissions. As shown in the table, there is a significant difference between the time periods before and after the existence of the web. This indicates that the presence of this web-based digital reporting system can assist in department performance and enhance efficiency in reporting.

Paper Usage

Table 5. Paper Usage in a Day

Total User	Paper Quantity		Difference	Difference (%)
	Before	After		
267	1068	267	801	300

Table 6. Paper Usage in a Week

Total User	Paper Quantity		Difference	Difference (%)
	Before	After		
267	5340	1335	4005	300

Table 5 and Table 6 show the difference in paper usage per 1 day and 1 week. It can be seen that the digital report system has made a significant paper reduction of up to 300%. Initially, each user needed four paper sheets to carry out reporting activities on shift 1 and shift 2. Through this digital reporting system, users only need 1 paper for administration and for reporting findings in the field can use the digital system that has been developed.

5 Conclusion

A digital report system using MySQL, Express.js, React.js, and Node.js on a VPS can improve the report generation and management processes. This comprehensive solution offers robust data storage, retrieval, and routing capabilities, while leveraging the scalability and control of a VPS. Implementing this system can increase productivity,

streamline workflow, and enhance operational efficiency, driving success and competitiveness in today's digital landscape.

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