

Design and Development of a Hazard Report Application As a Hazard Reporting Medium for Employees at PT XYZ

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Abstract

Introduction: Hazard reporting is essential for identifying unsafe actions and conditions before they lead to occupational incidents. At PT XYZ, the existing manual reporting process limits documentation, monitoring, and timely corrective actions. **Objective:** This study aimed to develop and evaluate a digital Hazard Report application to support workplace hazard reporting at PT XYZ. **Method:** A Research and Development (R&D) approach using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) was applied. Data were collected through observation and interviews, while application usability was evaluated using the USE Questionnaire involving 35 employees. **Results and Discussion:** The developed application supports real-time hazard reporting, structured documentation, corrective action monitoring, and report status tracking. Usability evaluation showed significant results across usefulness, ease of use, ease of learning, and satisfaction ($p < 0.001$), with very large effect sizes (Cohen's $d = 2.20-3.02$). **Conclusion:** The Hazard Report application demonstrated high usability and is feasible as a digital platform for supporting a more structured and accessible hazard reporting process at PT XYZ.

Introduction

Occupational safety and health (OSH) management requires systematic hazard identification and reporting to prevent unsafe actions and unsafe conditions from developing into occupational incidents. Hazard reporting provides an important mechanism for employees to communicate potential hazards encountered during daily activities and enables organizations to initiate corrective actions before an incident occurs. In addition, hazard reporting data can serve as a leading indicator for evaluating employee participation and the effectiveness of workplace risk control (Nadhifa & Prastawa, 2022). The advancement of digital technology has created opportunities to transform conventional occupational safety reporting into more accessible, real-time, and integrated systems. Digital reporting systems can facilitate the collection, storage, monitoring, and analysis of hazard information and improve the traceability of corrective actions. Previous studies have reported that digital systems can address limitations associated with manual reporting, including reporting delays, fragmented documentation, and difficulties in retrieving and monitoring safety information. Digital hazard reporting can therefore support more systematic safety management and data-driven decision-making (Aini et al., 2022).

However, the successful implementation of a digital reporting system depends not only on application functionality but also on users' readiness to adopt the technology. Digital and information literacy can influence employees' perceived ease of use and their attitudes toward workplace technologies, indicating that employees' ability to operate digital devices and applications should be considered when introducing a digital reporting system. In the context of a smartphone-based hazard reporting application, practical factors such as employee access to compatible mobile devices, the availability and reliability of internet connectivity in operational areas, and employees' familiarity with digital applications may affect the accessibility and consistent use of the system. Consequently, user training, system socialization, and accessible interface design are important considerations during implementation, particularly when employees have different levels of technological experience.

At PT XYZ, hazard reporting was previously conducted through conventional communication to supervisors before being forwarded to the responsible personnel. The process was not supported by an integrated mechanism for recording, documenting, and monitoring corrective actions, which could limit the traceability of reported hazards. Therefore, a smartphone-based Hazard Report application was developed to provide employees with a more structured reporting mechanism and to support the Health, Safety, and Environment (HSE) department in documenting and monitoring hazard reports. The use of smartphones was selected to provide flexible access to the reporting system; however, device availability, network accessibility, and workers' digital literacy remain relevant considerations for sustainable implementation.

In addition to accessibility and technological readiness, digital hazard reporting introduces concerns regarding the protection of user information. Digital applications may collect employee identification, workplace information, hazard descriptions, and photographic evidence; therefore, appropriate data governance is required to prevent unauthorized access, disclosure, or misuse. Studies on mobile applications have emphasized authentication and authorization, access management, secure data storage, confidentiality, and transparent privacy policies as important components of data protection. Accordingly, access to the developed Hazard Report application is restricted through user authentication, while different access privileges are assigned according to

user roles. Nevertheless, comprehensive assessment of data security and privacy was beyond the scope of the present usability evaluation and should be addressed in further system development.

Based on these considerations, this study aimed to design, develop, implement, and evaluate a digital Hazard Report application as a workplace hazard reporting platform at PT XYZ. The application was developed using the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model. Its usability was subsequently evaluated using the USE Questionnaire, which assesses four dimensions: usefulness, ease of use, ease of learning, and satisfaction (Shalihah et al., 2025).

Method

This study employed a Research and Development (R&D) approach to develop a digital Hazard Report application aimed at improving the effectiveness of hazard reporting in occupational safety and health management at PT XYZ. The application was developed using the ADDIE model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. Through these stages, user needs and existing system limitations were identified, followed by system design and prototype development, application implementation, and usability evaluation to ensure that the developed application effectively supports hazard reporting activities in the workplace (Shalihah et al., 2025).

Result and Discussion

In the analysis stage, data were collected through field observations, interviews with HSE personnel and management, and a literature review. Field observations were conducted to examine the existing hazard reporting practices, identify operational challenges, and understand the workflow of hazard management at PT XYZ. Interviews with HSE personnel and management were carried out to gather information regarding user requirements, reporting procedures, system expectations, and obstacles encountered in the current manual reporting process. In addition, a literature review was performed to examine relevant theories, standards, and previous studies related to hazard reporting systems, occupational safety and health management, and digital application development. The findings from these activities were used to identify existing problems, determine user needs, and define the functional and non-functional requirements for the development of the Hazard Report application.

In the development stage, the Hazard Report application was developed as a web/mobile-based prototype integrated with a centralized database system to support real-time hazard reporting and data management. The development process included coding the application functionalities, creating user interfaces, configuring the database structure, and integrating all system components. Several key features were implemented, including user authentication, hazard report submission, photo and video evidence upload, report status monitoring, automatic email notifications, and database management. The integration of the application with the database enabled real-time storage, retrieval, and processing of hazard reports, allowing users and administrators to access up-to-date information and monitor corrective actions efficiently. The design modelling is as follows:

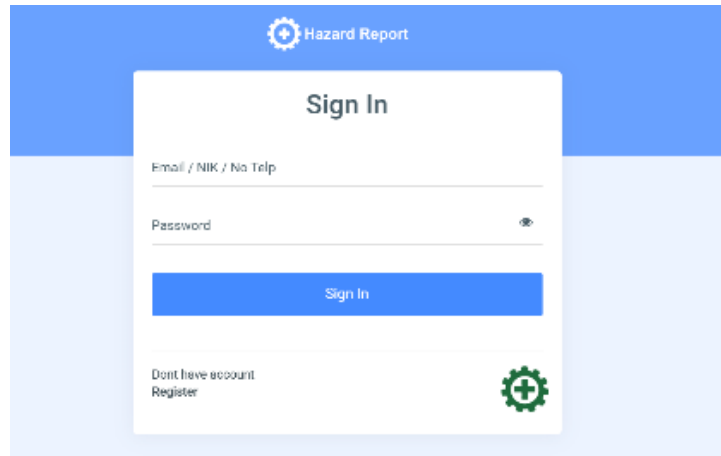


Figure 1. Hazard Report application

The figure below shows the initial login page of the Hazard Report application, which is used by both users and administrators to access the system. The login page serves as an authentication gateway that ensures only registered users with appropriate access rights can enter the application. On this page, users are required to enter their registered email address or Employee Identification Number (Employee ID) along with their password. Once the credentials are successfully verified by the system, users are redirected to their respective dashboards based on their roles and access privileges. This login mechanism helps maintain the security of hazard reporting data and ensures that all activities performed within the application can be traced to the registered user.

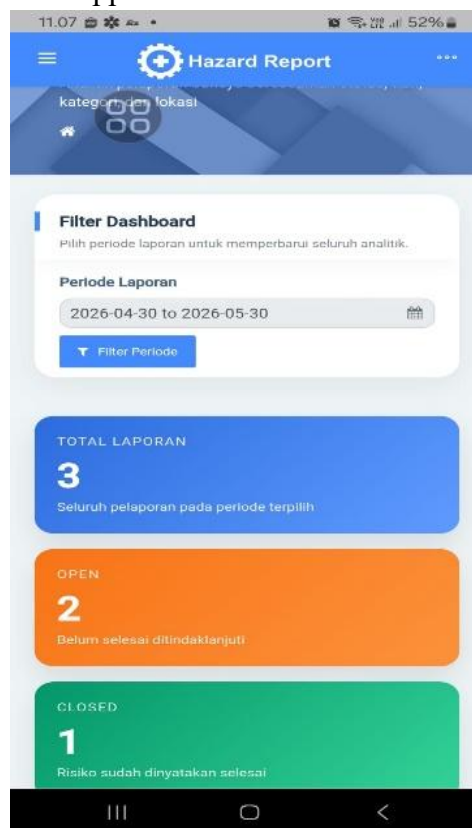


Figure 2. The dashboard page

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The dashboard page provides statistical information related to hazard reports submitted through the Hazard Report application. This feature allows users and administrators to monitor reporting activities in real time through a centralized display. The dashboard presents the total number of hazard reports submitted by employees, providing an overview of employee participation in hazard reporting activities. In addition, the reports are categorized based on their current status, namely open and closed. Open reports represent hazards that have been identified but have not yet been fully resolved, while closed reports indicate that corrective actions have been completed and verified. By presenting this information in a visual and structured format, the dashboard enables administrators to track report progress, evaluate the effectiveness of corrective actions, and identify trends in workplace hazards to support data-driven decision-making in occupational safety and health management.

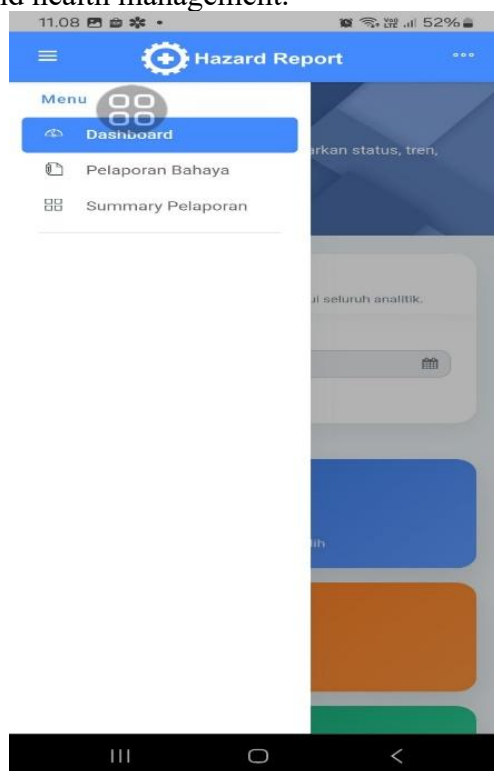


Figure 3. Application Menu

The application menu consists of three main features: Dashboard, Hazard Reporting, and Hazard Report Summary. The Dashboard menu provides an overview of statistical information related to hazard reports, including the total number of reports submitted and their current status. The Hazard Reporting menu serves as the primary interface for users to submit hazard reports by entering relevant information, such as the location, description of the hazard, and supporting evidence in the form of photos or videos. Meanwhile, the Hazard Report Summary menu presents a compilation of all submitted reports in a structured format, enabling users and administrators to review reporting trends, monitor report statuses, and analyze hazard data for occupational safety and health improvement purposes.

The screenshot displays the 'Hazard Report' application interface. It features a blue header with the app's name and a hamburger menu icon. The main content area is split into two columns. The left column, titled 'Form Pelaporan Bahaya', includes a 'Kembali' button and a section 'A. Data Pelaporan Bahaya' with input fields for 'Nama Pelapor', 'Bagian / Departemen', 'Lokasi Temuan', 'Kategori Bahaya' (selected as 'Unsafe Condition (Kondisi Tidak Aman)'), 'Tanggal Temuan' (30/05/2026), 'Waktu Temuan' (11.08), and 'Uraian Hazard'. The right column, also titled 'Hazard Report', includes a 'Kategori' dropdown (selected as 'Unsafe Condition (Kondisi Tidak Aman)'), 'Tanggal Temuan' (30/05/2026), 'Waktu Temuan' (11.08), 'Uraian Hazard', 'Evidence Temuan' with a 'Pilih File' button and a message 'Tidak ada file yang dipilih', and an upload area with the text 'Upload foto atau video temuan hazard.' and 'Belum ada evidence temuan'. A blue 'Submit Pelaporan Bahaya' button is at the bottom right.

Figure 4. Hazard Reporting menu

The Hazard Reporting menu enables users to report hazardous conditions identified during their activities within the company. This feature serves as the primary interface for collecting hazard information directly from employees in real time. To submit a report, users are required to complete several data fields, including the reporter's name, department or division, location of the hazard, hazard category (Unsafe Action or Unsafe Condition), and the date when the hazard was identified. Users must also provide a detailed description of the hazardous condition or unsafe act observed to ensure sufficient information is available for further evaluation and corrective action. In addition, the system allows users to upload photographic evidence of the identified hazard to support report validation and facilitate the investigation process. Once all required information has been completed, the report can be submitted through the system and automatically recorded in the database for review and follow-up by the administrator

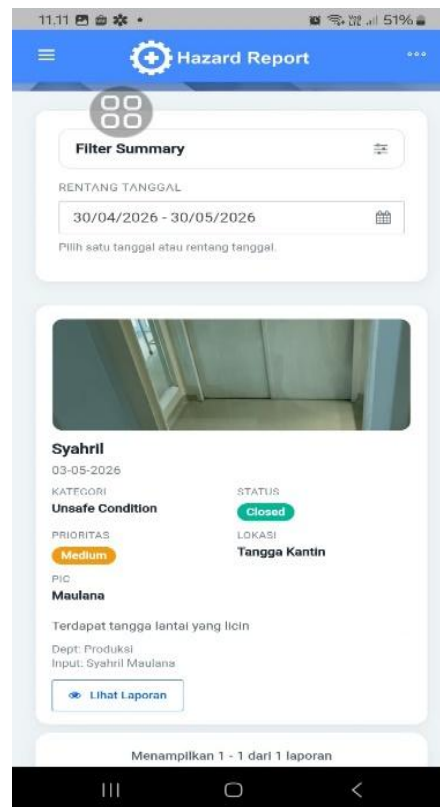


Figure 5. Hazard Report Summary menu

The Hazard Report Summary menu allows employees to view all hazard reports that have been submitted through the application in a detailed and organized manner. This feature provides transparency regarding the status and progress of each reported hazard. Employees can monitor whether a report is still under review, in the process of corrective action, or has been completed and closed. Detailed information displayed in this menu includes the report identification number, reporting date, hazard category, location, description of the hazard, and current status of the report. Furthermore, for reports that have been successfully resolved, employees can access corrective action evidence in the form of photographs uploaded by the administrator after the hazard has been addressed. This functionality enables employees to verify that the reported hazard has been properly managed and promotes greater engagement in the hazard reporting process. By providing visibility into corrective actions and report status, the Hazard Report Summary feature supports accountability, enhances communication between employees and management, and contributes to the continuous improvement of occupational safety and health performance.

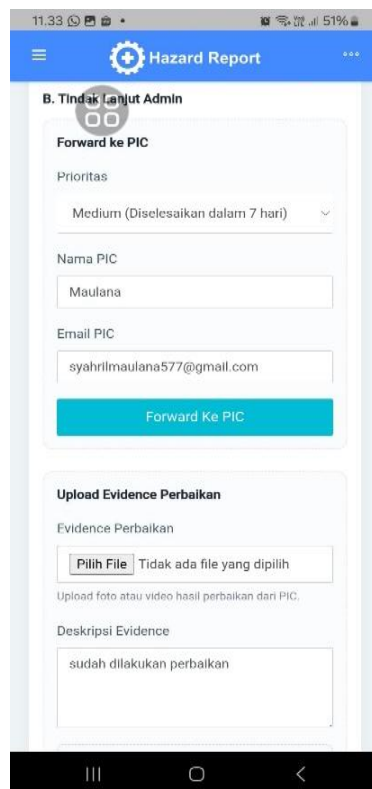


Figure 6. Hazard Report Summary Interface

The Hazard Report Summary interface for administrators provides comprehensive report management and corrective action monitoring functionalities. Through this feature, administrators can review all incoming hazard reports and determine the priority level of corrective actions based on the severity and potential impact of the identified hazards. After assessing the report, the administrator assigns a Person in Charge (PIC) responsible for implementing the corrective action and enters the PIC's email address into the system. The application then automatically forwards the hazard report information to the designated PIC via email notification, ensuring that corrective actions can be initiated promptly.

Once the corrective action has been completed, the PIC submits evidence of the completed work to the administrator. The administrator then verifies the corrective action and uploads the final evidence, such as photographs documenting the improved condition, into the system. After confirming that the hazard has been adequately addressed, the administrator updates the report status from *open* to *closed*. This workflow enables effective monitoring of corrective actions, improves accountability among responsible personnel, and ensures that all reported hazards are properly documented and resolved. Furthermore, the integration of report status tracking and corrective action evidence enhances transparency and supports continuous improvement in occupational safety and health management.

In the implementation stage, the developed Hazard Report application was deployed through limited-scale testing involving employees as end users. This testing phase aimed to evaluate the functionality of the application under actual operational conditions and to identify potential issues before full-scale implementation. Employees were asked to use the application to perform hazard reporting activities, including submitting reports, uploading supporting evidence, and monitoring report statuses.

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Following the testing process, system socialization and training sessions were conducted to familiarize users with the application's features, reporting procedures, and system workflows. These activities were intended to ensure that users could operate the application effectively and maximize its utilization in supporting workplace hazard reporting processes.

The evaluation stage was conducted to assess the usability of the developed Hazard Report application after its implementation at PT XYZ. The evaluation involved 35 employees who had participated in the application testing process. Usability was assessed using the USE Questionnaire, which consists of four dimensions: usefulness, ease of use, ease of learning, and satisfaction. These dimensions were used to determine users' perceptions regarding the benefits of the application, ease of operation, ease of learning, and overall satisfaction with the developed system.

The evaluation results demonstrated a very high level of usability across all four dimensions. Statistical analysis showed a significance value of $p < 0.001$ for all dimensions, indicating that the respondents' assessments were significantly above the predetermined reference value. In addition, Cohen's d values ranged from 2.20 to 3.02, accompanied by positive mean differences, indicating very large effect sizes. These findings demonstrate strong positive user perceptions of the Hazard Report application in terms of usefulness, ease of use, ease of learning, and satisfaction.

The high usability assessment indicates that the application can support employees in conducting hazard reporting through a more accessible and structured digital platform. The usefulness dimension reflects the perceived benefits of the application in supporting hazard reporting activities, while the ease-of-use and ease-of-learning dimensions indicate that users can operate and understand the application without substantial difficulty. Furthermore, the positive satisfaction assessment reflects users' acceptance of the application as a digital medium for workplace hazard reporting. Therefore, the evaluation results support the feasibility of implementing the Hazard Report application as a digital hazard reporting platform at PT XYZ.

Study Limitations

This study has several limitations that should be considered when interpreting its findings. First, the application was evaluated at a single company, PT XYZ, involving only 35 employees, limiting the generalizability of the results to other occupational settings. Second, the evaluation focused primarily on usability using the USE Questionnaire, which measures perceived usefulness, ease of use, ease of learning, and satisfaction rather than actual improvements in workplace safety performance. Third, limited-scale testing did not assess long-term application adoption, reporting consistency, or sustained employee engagement. Additionally, objective performance indicators, including hazard reporting frequency, corrective action completion time, and incident reduction, were not evaluated. Technical factors such as internet connectivity, device compatibility, system reliability, and data security were not comprehensively assessed. Future research should involve larger and more diverse samples, extended implementation periods, and objective safety performance measurements to determine the application's effectiveness, sustainability, and contribution to occupational safety management in various industrial environments.

Conclusion

The Hazard Report application developed using the ADDIE model demonstrated a very high level of usability among 35 employees at PT XYZ. Evaluation using the USE Questionnaire showed significant results across usefulness, ease of use, ease of learning, and satisfaction ($p < 0.001$), with very large effect sizes (Cohen's $d = 2.20$ – 3.02). These findings indicate that the application is feasible as a digital hazard reporting platform and can support a more structured and accessible hazard reporting process at PT XYZ.

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