



# Design and Evaluation of the Bantayan Online Fire Report System for Enhancing Emergency Response in Remote Communities

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**Abstract:** Fire safety in remote and geographically isolated regions, such as Bantayan Island, is chronically hindered by fragmented infrastructure, delayed emergency response cycles, and a systemic lack of accessible fire safety education. These vulnerabilities often transform manageable incidents into large-scale disasters. This study introduces the Bantayan Online Fire Report System, a comprehensive web and mobile-based ecosystem engineered to bridge the critical communication gap between residents and emergency personnel. The development process was strictly guided by the ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) model, ensuring the platform met rigorous standards for functional suitability, reliability, and the security. The system architecture integrates a centralized administrative dashboard for real-time resource mapping, automated push notifications for rapid dissemination of safety protocols, and a lightweight mobile interface optimized for low-bandwidth environments common in rural areas. By digitizing the reporting pipeline, the platform replaces traditional, high-latency communication methods with instantaneous data transmission and GPS-enabled location tracking. Initial pilot testing and empirical evaluations demonstrated a significant reduction in incident-to-response latency and a measurable increase in community disaster awareness.

**The system was appraised through usability testing, where it achieved high scores in learnability and user satisfaction among both local authorities and residents. These findings underscore the transformative potential of localized digital interventions in overcoming logistical barriers in underserved communities. Ultimately, the Bantayan Online Fire Report System serves as a scalable prototype for enhancing disaster resilience, proving that integrating technology with civic participation can effectively mitigate fire-related risks and safeguard human life in the remote Maritime Provinces.**

**Keywords: Bantayan Island, emergency response, Fire safety, ISO/IEC 25010, online reporting, usability testing**

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## I. INTRODUCTION

Fire safety in remote communities such as Bantayan Island faces persistent challenges due to inadequate infrastructure, slow emergency response times, and limited fire safety education [10] [11]. These issues often result in delayed interventions, greater property damage, and heightened risks to human life. The Bantayan Online Fire Report System has been conceptualized to address these gaps by providing a web and mobile-based platform for real-time fire incident reporting, resource allocation, and community engagement. By leveraging digital technologies, the system seeks to empower residents to quickly report fire incidents, enabling authorities to respond more efficiently and effectively. Online reporting systems have been shown to close communication gaps in rural areas and improve emergency response efficiency [1] [2]. This project integrates dashboards, notifications, and mobile accessibility to enhance communication between residents and authorities, thereby improving emergency response and preparedness.

The system's design emphasizes accessibility and usability, ensuring that even communities with limited technical exposure can participate in fire safety initiatives. Dashboards provide authorities with a centralized view of reported incidents, resource availability, and response progress, while notifications keep residents informed about ongoing emergencies and safety instructions. Mobile accessibility ensures that reports can be submitted instantly, even from geographically isolated areas, reducing the lag between incident occurrence and official response. Furthermore, the project promotes community engagement by encouraging residents to take an active role in fire prevention and preparedness. Through awareness campaigns and educational modules integrated into the platform, the system aims to strengthen local knowledge of fire safety practices. Ultimately, the Bantayan Online Fire Report System represents a significant step toward building resilient communities by combining technology, education, and civic participation to mitigate the risks associated with fire emergencies [3] [4].

**OBJECTIVE**— The **Bantayan Online Fire Report System** aims to design, develop, and evaluate a web and mobile-based platform that strengthens fire safety management in remote communities like Bantayan Island. By leveraging ICT, it modernizes traditional reporting methods that are prone to human error and delays [5] [12]. Specifically, the system seeks to:

1. Develop a system which:

1.1 Enable **real-time incident reporting** to reduce emergency response delays [1] [23].

1.2 Establish a **centralized dashboard** for efficient management of teams, requests, and reports [2] [25].

1.3 Provide **user-friendly access** for residents to submit incidents, track status, and access fire safety resources [4] [13].

1.4 Integrate **mobile accessibility and push notifications** for timely communication between residents and authorities [24] [10].

2. Conduct **usability testing** guided by ISO/IEC 25010 to ensure usefulness, satisfaction, ease of use, and learnability [26] [11][27].

By achieving these objectives, the project seeks to improve emergency preparedness, strengthen community engagement, and ensure that fire safety interventions in Bantayan Island are more reliable, accessible, and responsive.

## II. METHODS

This system is a developmental research[27] following the ISO/IEC 25010:2011 SQuaRE model to ensure quality in performance, reliability, security, and usability [22]. The methodology included:

- System Design: Conceptual framework incorporating input (user data, incident details), process (data storage, notifications, team assignment), and output (reports, dashboards).

- Functional Modules: Admin side (login, control team management, requests, daily reports, archives, user list, settings) and user side (home page, report submission, status viewing, safety tips, citizen's charter, upcoming events).

- Technology Stack: Web and mobile platforms with front-end and back-end integration, data encryption, and client-server architecture [19].
- Evaluation: Usability testing based on usefulness, satisfaction, ease of use, and learnability [21][27].

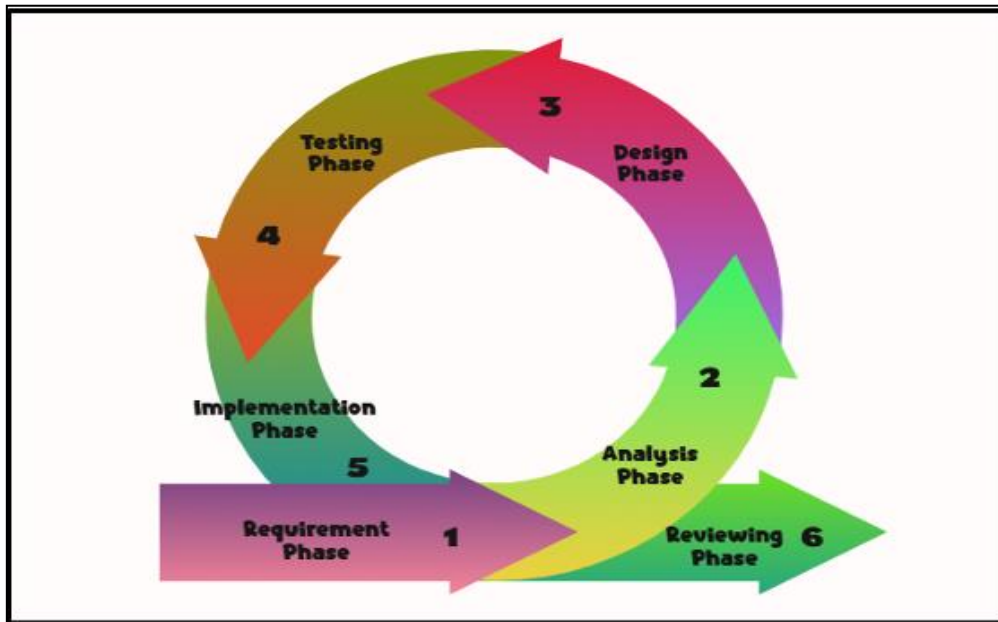


Figure 1. Agile Development Model

This study aims to create a website employing the Agile Development Model. The Agile Development Model approach, which entails determining the goals and information needs, designing the system, constructing the system, and putting the new system into use, is the methodology utilized in this design. The design phase is the only phase covered by this study. A more effective and efficient design of the information system is the end consequence of the design. According to the study's findings, the ADL technique takes less time to develop an information system, but it also necessitates effective user and system designer coordination.

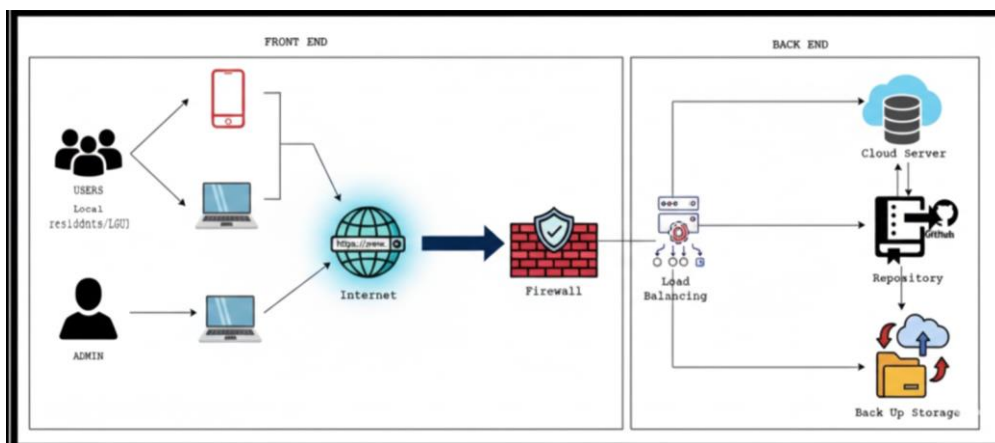


Figure 2. System Architecture

The system architecture includes a web-based interface for citizens to report fires, a backend server for data processing, and sends notifications to fire department personnel. Data flows from the front end, where reports are submitted, to the backend, where it is stored, analyzed, and acted upon. Once the setup was completed, authorized users were granted access to the online fire report system.

### III. RESULTS

The Bantayan Online Fire Report System successfully provided:

- A real-time dashboard displaying control teams, pending requests, assigned requests, ongoing requests, and completed requests.
- Admin functionalities for report management, team assignment, and daily report generation.
- User functionalities for incident reporting, status tracking, and access to fire safety resources [20].
- Notifications for both administrators and users to ensure timely updates.
- A mobile application for accessibility and engagement [7].

TABLE I  
IN TERMS OF DISPLAYING DASHBOARD.

Criteria	Mean	Verbal Interpretation
Numbers of Control teams	4.00	Functional
Numbers of Pending request	3.67	Functional
Numbers of Assigned request	4.00	Functional
Numbers of Team OTW requests	4.33	Strongly Functional
Numbers of On-progress request	4.00	Functional
Numbers of Completed requests	4.00	Functional
Total	4.00	Functional

Table 1 shows that the Bantayan Island Online Fire Report System’s overall functionality is rated as "Strongly Functional," with an average mean score of 4, indicating effective performance across various dashboard display metrics. The lowest scores, each with a mean of 3.67 and classified as "Functional," were observed in the display of the total number of pending requests, suggesting that these features are functional but could benefit from minor improvements in clarity or accessibility. In contrast, the highest scores, with a mean.

TABLE III  
IN TERMS OF ADMIN CREATING, READING, UPDATING AND DELETING REPORTS.

Description	Mean	Verbal Interpretation
Creating Reports	4.33	Strongly Functional
Reading Reports	4.67	Strongly Functional
Updating Reports	4.33	Strongly Functional
Deleting Reports	4.00	Strongly Functional
TOTAL	4.33	Strongly Functional

Table 2 shows the total mean score for Bantayan Online Fire Report System 4.33, classified as “Strongly Functional” indicating that the system performs effectively across most functionalities. The highest score, 4.67, was given to the functionality for reading detailed reports, suggesting this feature is particularly effective and user-friendly. In contrast, the lowest score of 4.00 for the deletion functionality, classified as "Functional," suggests some room for improvement in this area. Overall, the system meets its administrative goals effectively, with some functionalities rated more favorably than others.

TABLE III  
IN TERMS OF USEFULNESS, EASE OF USE, EASE OF LEARNING, AND SATISFACTION

Description	Mean	Verbal Interpretation
Usefulness	4.33	AGREE
Ease of Use	4.27	AGREE
Ease of Learning	4.25	AGREE
Satisfaction	4.33	AGREE
TOTAL	4.30	AGREE

Table 3 above shows the Bantayan Island Online Fire Report System total mean score is 4.30, which is read as agree. Ease of learning had the lowest score, with a mean of 4.25. This implies that even while consumers believe the system to be usable, there might be a few minor complexities or places where it could be simplified to improve user interaction. However, usefulness and satisfaction both received scored the highest at 4.33 suggesting that consumers regard the system's usefulness and ability to suit their demands. This high grade suggests that the system is useful tool for its intended function, assisting people in their duties.

#### IV. DISCUSSION

The system addresses critical gaps in fire safety management in remote areas by leveraging digital tools for real-time communication and resource allocation. Compared to prior arts such as FireCast, RapidResponse, and Community FireWatch, the Bantayan system emphasizes localized needs, integrating safety tips, citizen engagement, and municipal coordination [17] [18] [20]. Limitations include the absence of local dialects and restricted use to Bantayan Island residents. Future improvements may involve multilingual support, predictive analytics for fire risk assessment [9], and integration with national fire safety databases.

#### V. CONCLUSIONS

The Bantayan Online Fire Report System enhances fire safety management in Bantayan Island by providing a comprehensive, user-friendly platform for incident reporting and emergency response. It strengthens community resilience, improves resource allocation, and fosters public engagement in fire safety. The system demonstrates the potential of digital platforms to bridge communication gaps and improve disaster preparedness in underserved communities.

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