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# WEB-ACCESS EMERGENCY RESPONSE COORDINATION AND INCIDENT COMMAND MANAGEMENT SYSTEM

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**Abstract:** The increasing frequency of natural disasters, public health emergencies, and large-scale incidents has emphasized the importance of establishing an efficient and well-coordinated emergency response system. This study developed a Web-Access Emergency Response Coordination and Incident Command Management System (ERC-ICMS) designed to enhance real-time reporting, resource tracking, incident classification, and inter-agency coordination. Guided by the Agile Methodology, the system integrates core functionalities such as incident reporting, automatic GPS-based location detection, classification of emergencies (fire, medical, natural disaster), real-time monitoring of deployed resources, access to Standard Operating Procedures (SOPs), and visualization of incident trends and resource availability. The system was evaluated using the ISO/IEC 25010 Software Quality Model and Quality in

**Use criteria. Results of user and expert evaluations revealed a Very Good rating across most indicators. Web access features obtained mean scores ranging from 3.3 to 4.0, confirming strong functionality in emergency management. Product quality factors such as functional suitability (4.5), reliability (4.6), maintainability (4.6), and security (4.5) demonstrated high system performance. User acceptability achieved a Grand Mean of 4.4, with usefulness receiving the highest rating of 5.0. Although environmental risk mitigation (4.2) and portability (4.2) scored slightly lower, both remained within acceptable levels. Overall, findings show that the developed system is functional, reliable, and highly acceptable, providing significant support for emergency coordination, operational decision-making, and community safety. The study recommends enhancements in visualization tools, SOP accessibility, and environmental risk features to further strengthen system capability.**

**Keywords: Emergency Response System, Incident Command Management, Web-Based System, ISO/IEC 25010, Disaster Coordination, Real-Time Tracking, Agile Methodology**

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## I. INTRODUCTION

The increasing occurrence of natural disasters, industrial incidents, and public health emergencies has highlighted the need for an efficient and well-coordinated emergency response system (Johnson et al., 2017; Patel & Kim, 2019). Traditional approaches to emergency management often rely on manual coordination, which can result in delays, inefficiencies, and communication failures (Smith et al., 2018). To address these challenges, the implementation of a web-based emergency response coordination and incident command management system provides a promising solution to enhance disaster preparedness, response, and recovery efforts (Garcia et al., 2021).

Emergency response coordination requires the collaboration of multiple agencies, organizations, and stakeholders to minimize the impact of crises and ensure public safety (Jones & Brown, 2020). Effective incident command management depends on seamless communication, real-time information sharing, and well-integrated decision-making processes. Conventional methods, such as radio-based communication and paper documentation, often limit response efficiency, leading to delays in critical operations and resource deployment (Nguyen et al., 2022). Advancements in web-based technologies have transformed emergency management by enabling a centralized and accessible platform for real-time.

Coordination (Lee & Zhao, 2020). A web-based emergency response system allows responders to access vital information, manage incidents efficiently, and communicate across agencies, regardless of location. Such a system can integrate key functionalities, including geographic information system (GIS) mapping, automated alerts, incident tracking, resource management, and situational awareness dashboards, to enhance overall response effectiveness (Smith et al., 2018).

Despite advancements in technology, existing emergency response systems still face several challenges, including a lack of multi-agency integration, reliance on outdated communication methods, limited real-time tracking, inadequate automation, accessibility constraints, and insufficient post-incident analysis. These gaps hinder effective response coordination and disaster management.

This study aims to develop a system that reporting & Tracking that enables citizens and first responders to report incidents (e.g., fire, flood, earthquake) via mobile app, phone calls, or SMS, automatically pinpoint incident locations using GPS data for faster response, classify incidents (e.g., fire, medical, natural disaster) for efficient dispatch, maintain a database of available resources (e.g., fire trucks, ambulances, personnel, equipment), track the location and status of deployed resources real-time, enable secure, real-time communication among first responders, command centers, and other stakeholders, present critical information (e.g., incident trends, resource availability) through dashboards and reports, access to standard operating procedures (SOPs) and checklists for different incident types.

### Objectives of the Study

The main objective of this capstone project is to develop and implement a Web-Access Emergency Response Coordination and Incident Command Management System.

### Specifically, the study aims to:

1. Develop a system that will:
  - a) Enables citizens and first responders to report incidents
  - b) Automatically pinpoint incident locations
  - c) Determine incidents (e.g., fire, medical, natural disaster)

- d) Track the location and status of deployed resources real-time
  - e) Present critical information (e.g., incident trends, resource availability) through visual presentation
  - f) Access to standard operating procedures (SOPs) and checklists for different incident types.
2. Evaluate the overall quality of the developed application based on the ISO/IEC 25010 Software Quality Model and Quality in the Use Criteria, specifically assessing:
    - a) Product Quality through IT experts' evaluation in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability, and
    - b) Quality in Use through end-user's assessment in terms of effectiveness, efficiency, satisfaction, freedom from risk, and context coverage.

## II. MATERIALS AND METHODS

The researchers used a descriptive developmental approach which is the systematic study of putting into the design, developing, and careful evaluation of instructional programs, processes, and products that must meet the standard or criteria.

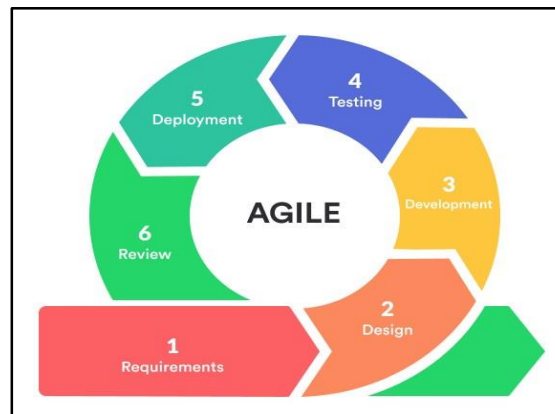


Figure 1. *Software Development Life Cycle*

Figure 1 shows the methodology used in the development of the proposed system. The researchers used a process models of the System Development Life Cycle known as the Agile Approach Model. The approach model anticipates changes and allows for much more flexibility than traditional methods. The process involves breaking down each project into prioritized requirements and delivering each individual within an iterative cycle.

**Requirements.** In this phase, the requirements for the system are gathered and analyzed. This includes identifying the user requirements, business rules, and data requirements for the system. For the Web-Access Emergency Response Coordination and Incident Command Management System, this involves identifying the specific features and functions needed for the Emergency Response Coordination process, and Incident Command Management System process.

**Design.** In this phase, the system architecture is designed, and detailed specifications are developed. For the Web-Access Emergency Response Coordination and Incident Command Management System, this involves designing the user interface, data models, and workflows.

**Development.** This phase involves the actual development of the software. For the Web-Access Emergency Response Coordination and Incident Command Management System, this includes programming of the web-system, setting up and configuring the database to manage incident and user data, and implementing role-based access control for different user types (citizens, first responders, administrators).

**Testing.** In this phase, the system is tested to ensure that it meets the requirements and specifications. For the Web-Access Emergency Response Coordination and Incident Command Management System, this includes testing Emergency Response Coordination process, and Incident Command Management System process functions to ensure they work correctly.

**Deployment.** In this phase, the researchers plan to deploy after conducting a series of tests with the IT experts to check that the system is fully functional.

**Review.** Review phase focuses on evaluating the delivered increment and gathering feedback from users. The feedback is for identifying areas of improvement, addressing any issues or concerns, and refining the product backlog for future iterations.

**Data Gathering Procedures.** In particular, semi-structured interviews and theme analysis are used by the researchers to collect and analyze data. Participant in-depth interviews are conducted as part of the procedure in order to obtain comprehensive insights and viewpoints. After transcribing and coding the interview material, the researchers did a thematic analysis to find recurrent themes and patterns.

### III. RESULTS AND DISCUSSION

After thorough evaluation of the experts and respondents, the following are discovered:

Table 1. *Level of User Acceptability in terms of Web-Access Sustainable Development Goals Monitoring System of Non-Profit Organization with Targeted Analytics*

Criteria	Mean	Interpretation
Enables citizens and first responders to report incidents.	3.7	Very Good
Automatically pinpoint incident locations.	3.7	Very Good
Determine incidents (e.g., fire, medical, natural disaster).	4.0	Very Good
Track the location and status of deployed resources in real-time.	4.0	Very Good
Present critical information (e.g., incident trends, resource availability) through visual presentation.	3.3	Very Good
Access to standard operating procedures (SOPs) and checklists for different incident types.	3.3	Very Good
<b>Grand Mean</b>	<b>3.7</b>	<b>Very Good</b>

Table 1 Shows that the Web Access features of an Emergency Response Coordination and Incident Command Management system are generally rated “Very Good” across all indicators, reflecting strong functionality and user satisfaction. The system effectively enables both citizens and first responders to report incidents and can automatically pinpoint exact locations, each earning a mean of 3.7. It also performs well in its ability to determine incident types whether fire, medical, or natural disaster and to track deployed resources in real time, both obtaining a higher mean of 4.0. Meanwhile, its capacity to present critical information through visual formats and provide access to SOPs and checklists for different incident types is rated slightly lower, with a mean of 3.3, yet still within the “Very Good” interpretation. Overall, these results suggest that the system offers reliable support for efficient emergency coordination, situational awareness, and informed decision-making.

Table 2. *Level of User Acceptability in terms of determining the quality of the developed system based on ISO/IEC 25010:2011 Systems and Software Quality Requirements and Evaluation (SQuaRE) Quality Model.*

Criteria	Mean	Interpretation
Functional suitability	4.5	Very Good
Performance efficiency	4.3	Very Good
Compatibility	4.5	Very Good
Usability	4.3	Very Good
Reliability	4.6	Very Good
Security	4.5	Very Good
Maintainability	4.6	Very Good
Portability	4.2	Good
<b>Grand Mean</b>	<b>4.4</b>	<b>Very Good</b>

Table 2 Shows that the system demonstrates a high level of quality across multiple software evaluation criteria, with most areas rated Very Good and contributing to an overall grand mean of 4.4. The system performs exceptionally well in Reliability (4.6) and Maintainability (4.6), indicating that it operates consistently with minimal failures and can be efficiently updated or improved over time. Functional Suitability (4.5), Compatibility (4.5), and Security (4.5) also received strong ratings, reflecting that the system meets user needs, works well across various environments, and provides robust protection for data and processes. Additionally, Performance Efficiency (4.3) and Usability (4.3) are rated very good, showing that the system runs smoothly and remains user-friendly. Only Portability (4.2) scored slightly lower with a “Good” rating, suggesting minor limitations in transferring or adapting the system to other platforms, though overall performance remains highly satisfactory. Collectively, these ratings affirm that the system is reliable, secure, and effective, with strong potential for long-term use and adaptability.

Table 3. Level of User Acceptability in Terms of the usability of the developed system in terms of usefulness, satisfaction, ease of use, and learning.

<b>In Terms of usefulness, satisfaction, ease of use, and learning</b>	<b>MEAN</b>	<b>Verbal Interpretation</b>
<b>Effectiveness</b>	4.4	Very Good
<b>Efficiency</b>	4.4	Very Good
<b>Satisfaction</b>		
• Usefulness	5.0	Very Good
• Trust	4.4	Very Good
• Pleasure	4.4	Very Good
<b>Freedom from risk</b>		
Economic risk mitigation	4.4	Very Good
Health and safety risk mitigation	4.4	Very Good
Environmental risk mitigation	4.2	Good
<b>Context coverage</b>		
Context completeness	4.4	Very Good
Flexibility	4.4	Very Good
<b>Grand Mean</b>	<b>4.4</b>	<b>Very Good</b>

Table 3 This table shows that the level of user acceptability of the developed system, particularly in terms of its usability, usefulness, satisfaction, ease of use, and learnability is rated overall as Very Good, with a grand mean of 4.4.

The system demonstrates strong effectiveness and efficiency, both rated at 4.4, indicating that users find it capable of achieving intended tasks accurately and with minimal effort.

Under the satisfaction component, usefulness stands out with a perfect mean of 5.0, showing that users highly value the system’s purpose and functionality, while trust and pleasure, both at 4.4, reflect a positive user experience and confidence in using the system. For freedom from risk, the system performs very well in mitigating economic, health and safety, and environmental risks, though environmental risk mitigation scored slightly lower at 4.2, interpreted as “Good.” In terms of context coverage, the system’s context completeness (4.4) indicates adaptability across various user scenarios, while its flexibility (4.4) suggests that it accommodates different user needs and conditions.

Overall, these results affirm that the system is highly acceptable to users, offering strong functionality, safety, satisfaction, and adaptability.

#### IV. SUMMARY OF FINDINGS

Based on the detailed presentation, discussion, interpretation, and analysis of research findings, the following summary is hereby presented.

1. The developed system shows a high level of usability and performance based on user evaluation, with most indicators rated Very Good.
2. In terms of Web Access for Emergency Response Coordination and Incident Command Management, the system effectively supports key functions such as incident reporting, automatic location pinpointing, incident type identification, and real-time tracking of deployed resources, with mean ratings ranging from 3.3 to 4.0, all interpreted as Very Good. These results indicate that the system can reliably support emergency response operations and provide essential information to users.
3. Access to critical information (incident trends and resource availability) and standard operating procedures (SOPs) received a mean rating of 3.3, still interpreted as Very Good, suggesting that these components are functional but may benefit from further enhancement for better clarity and accessibility.
4. In terms of user acceptability, the system obtained consistently high ratings across multiple areas such as effectiveness, efficiency, trust, pleasure, risk mitigation, context coverage, and flexibility, each with a mean of 4.4, interpreted as Very Good. This reflects that users find the system dependable, easy to use, and supportive of various tasks.
5. Usefulness stands out with the highest mean rating of 5.0, indicating excellent user perception of the system's value and relevance.
6. Environmental risk mitigation received the lowest rating of 4.2, interpreted as Good, but still indicates satisfactory performance.
7. The overall Grand Mean of 4.4, interpreted as Very Good, demonstrates that the system is highly acceptable, functional, and effective in supporting users, particularly in emergency response management and general system usability.

#### V. CONCLUSIONS

The result of the alpha and beta testing activities and system evaluation was positively proven. Therefore, the researcher concluded that:

1. The results show that the system's Web Access for Emergency Response Coordination functions such as incident reporting, automatic location detection, incident classification, and real-time resource tracking are all rated between 3.3 and 4.0 (Very Good), indicating that the system is highly effective in supporting emergency management operations.
2. The features that provide critical information and access to SOPs and checklists received mean scores of 3.3 (Very Good), demonstrating that the system delivers useful operational guidance, although these areas may still benefit from additional enhancement.
3. The system's overall usability, covering effectiveness, efficiency, trust, pleasure, context completeness, and flexibility, consistently earned ratings of 4.4 (Very Good), showing that users find the system reliable, easy to use, and capable of supporting different tasks and scenarios.
4. Usefulness achieved a perfect rating of 5.0, confirming that the system is extremely valuable and beneficial for its intended users.
5. The evaluation of risk mitigation shows strong performance in reducing economic and health-related risks with ratings of 4.4 (Very Good), while environmental risk mitigation scored 4.2 (Good), indicating acceptable effectiveness with room for further improvement.
6. The overall Grand Mean of 4.4 (Very Good) confirms that the developed system meets user expectations, performs reliably, and is generally accepted as an effective tool for emergency coordination and operational support.

#### VI. RECOMMENDATIONS

1. Enhance visual presentation tools (Mean: 3.3) by improving dashboards, charts, and real-time visualization features to make critical incident information more intuitive and easier to interpret.
2. Improve access and clarity of SOPs and checklists (Mean: 3.3) by updating content, simplifying navigation, and integrating quick-access buttons within the system to support faster decision-making during emergencies.

3. Strengthen features related to environmental risk mitigation (Mean: 4.2) by incorporating environmental alerts, hazard indicators, and sustainability- focused response guidelines to raise its rating to Very Good.
4. Optimize the portability of the system (identified earlier as needing improvement) by ensuring smoother performance across different devices, operating systems, and browsers to increase accessibility for all users.
5. Maintain and continuously upgrade core emergency response functions (Means: 3.7–4.0) such as incident reporting, location tracking, and incident classification to sustain accuracy, reliability, and real-time responsiveness.
6. Preserve high-performing usability features (Means: 4.4 and 5.0), especially usefulness and satisfaction elements, and conduct periodic user feedback sessions to ensure that the system remains aligned with user needs.
7. Implement user training programs to support system learning, maximize user efficiency, and ensure that all features especially those related to emergency response are fully utilized.
8. Conduct system audits and security reviews to maintain strong trust and safety scores (Mean: 4.4) and ensure that data handling, privacy, and system integrity remain at high standards.
9. Develop ongoing feature updates and maintenance schedules to sustain the system's already strong maintainability and reliability performance.
10. The future researcher is recommended to use this study as a reference to help improve the processes.

#### CONFLICTS OF INTEREST

The author declares that for this article she has no actual, potential or perceived conflict of interests. Financial disclosure: The research work is funded by the researcher.

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