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**BY**

**GROUP 25**

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# 1. REQUIREMENT GATHERING

The requirements of a disaster management system refer to the essential functionalities and features that such a system must possess to effectively prepare for, respond to, recover from, and mitigate disasters. These requirements encompass a comprehensive set of capabilities, including risk assessment tools, early warning systems, coordination protocols, resource management functionalities, and public communication channels. The goal is to ensure efficient disaster planning, response coordination, and community resilience in the face of emergencies and crises.

## 1.1 OVERVIEW OF DISASTER MANAGEMENT SYSTEM

### 1.1.1 INTRODUCTION

A Disaster Management System is a comprehensive solution designed to monitor and address a variety of natural and man-made disasters efficiently. By harnessing data from diverse sources, the system provides real-time insights, predictions, and alerts, enabling proactive measures to mitigate risks and minimize the impact of disasters.

It encompasses various strategies, processes, and resources aimed at minimizing the adverse effects of disasters on lives, property, and the environment.

### 1.1.2 KEY FEATURES OF A DISASTER MANAGEMENT SYSTEM

#### **1.MONITORING NATURAL DISASTERS:**

The system continuously monitors various natural disasters such as floods, earthquakes, hurricanes, and more. It aggregates data from satellite imagery, weather stations, IoT sensors, and social media platforms to provide a comprehensive view of potential threats.

#### **2. DATA COLLECTION AND ANALYSIS:**

Through advanced data collection and analysis techniques, the system processes large volumes of information in real-time. It identifies patterns, trends, and anomalies to forecast the occurrence and severity of disasters accurately.

#### **3.PREDICTIVE MODELING:**

Leveraging machine learning algorithms and predictive modeling techniques, the system generates forecasts for impending disasters. By analyzing historical data and current environmental conditions, it predicts the time, location, and magnitude of potential events.

#### **4. REAL-TIME ALERTS:**

For man-made disasters such as fires, industrial accidents, or terrorist incidents, the system provides instantaneous alerts to relevant authorities and the general public. These alerts facilitate swift responses and evacuation procedures, minimizing casualties and property damage.

#### **5. MITIGATION AND PREPAREDNESS:**

The Disaster Management System aids in the formulation of mitigation strategies and preparedness plans at local, regional, and national levels. It identifies vulnerable areas, assesses potential risks, and recommends proactive measures to enhance resilience and reduce the impact of disasters.

#### **6. RISK ASSESSMENT:**

Through comprehensive risk assessment methodologies, the system evaluates the potential impact of disasters on infrastructure, communities, and the environment. It helps decision-makers prioritize resources, allocate funding, and implement preventive measures to mitigate risks effectively.

#### **7. REDUCED RESPONSE TIME:**

By providing timely information, actionable insights, and automated alerts, the system significantly reduces the response time to disasters. This swift response improves emergency management coordination, resource allocation, and the overall effectiveness of disaster response efforts.

## 1.2. USER RESEARCH DOCUMENT FOR DISASTER MANAGEMENT SYSTEM

This user research aims to inform the development of a disaster management application specifically designed for the needs of Cameroonians. We will focus on understanding the diverse user groups within Cameroon, their specific needs during disasters, and how technology can facilitate effective disaster preparedness and response.

### 1.2.1 OBJECTIVES AND GOALS

- Identify the unique needs and challenges of different user segments in Cameroon regarding disaster management.
- Gain insights into user preferences, expectations, and behaviors related to disaster preparedness and response.
- Inform the design and development of a user-centric disaster management application that addresses the identified user needs.

### 1.2.2 APP OVERVIEW

The envisioned disaster management app will be a comprehensive tool providing timely information, alerts, and resources to individuals, local authorities, and emergency responders across Cameroon. It aims to facilitate proactive disaster preparedness, efficient response coordination, and community resilience-building efforts.

### 1.2.3 RESEARCH METHODOLOGY

A mixed-methods approach will be employed to achieve our objectives:

- **In-depth Interviews:** Representatives from diverse user groups, including community members, local authorities, and disaster response organizations, will be interviewed.
- **Surveys:** Distributed among a broader sample of Cameroonians, these surveys will gather quantitative data on disaster awareness, preparedness activities, and technology usage.
- **Usability Testing Sessions:** Prototype app designs will be evaluated through usability testing sessions to assess the user interface and functionality.

This approach provides a balanced perspective by combining qualitative insights with quantitative data to inform app development decisions.

### 1.2.4 PARTICIPANT DEMOGRAPHICS

Research participants will reflect the diversity of Cameroon's population, including individuals of various ages, genders, occupations, and geographic locations. We will prioritize inclusivity and strive to engage with marginalized communities to ensure their voices are heard.

### 1.2.5 FINDINGS

Key themes emerged from our research:

- **Varied Disaster Awareness:** Levels of disaster awareness and preparedness vary across regions and demographic groups.
- **Communication Reliance:** Community networks and traditional communication channels play a strong role in disaster information dissemination.
- **App Preferences:** A user-friendly and accessible mobile app with localized disaster alerts, guidance, and resources is desired.
- **Data Concerns:** Concerns regarding data privacy, trust in technology, and the need for culturally sensitive content were identified.

These findings will guide the development of targeted app features and functionalities.

### 1.2.6 USER PERSONAS

To understand the needs of our target audience, we have developed user personas representing key user groups:

#### 1. GENERAL PUBLIC

- Age Group: 13+
- **Accessibility Considerations:** The app prioritizes inclusivity, accommodating users with various disabilities and health conditions (e.g., asthma). It ensures individuals with different physical or medical needs can effectively access and utilize the system.
- **User Needs:** Easy access to information and timely alerts during disasters. The app empowers users to make informed decisions by providing user-friendly interfaces and clear communication channels, ensuring easy interaction regardless of physical abilities.

#### 2. GOVERNMENT AGENCIES

- **Primary Users:** Firefighters, emergency responders, disaster management agencies.
- **Functions:** These agencies rely on the app for comprehensive disaster monitoring, planning,

and risk assessment. They utilize collected data and analysis to coordinate emergency response efforts, allocate resources efficiently, and minimize the impact of disasters on communities and infrastructure.

### 3. INSURANCE COMPANIES

- **Primary Users:** Risk analysts, underwriters, claims adjusters.
- **Utilization of Data:** Insurance companies leverage app data for thorough risk assessments, insurance coverage planning, and resource allocation during disaster response and recovery phases. Real-time information and predictive analytics enable better understanding of potential risks and vulnerabilities, facilitating more accurate pricing and coverage decisions.

### 4. KEY CONSIDERATIONS

- **Accessibility:** Ensuring accessibility for users of all abilities, including those with disabilities or health conditions, is crucial for providing equitable access to critical disaster information.
- **Data Relevance:** Tailoring the data and insights provided by the app to meet the specific needs of each user persona enhances usability and effectiveness, ensuring relevance and utility for diverse user groups.
- **Collaboration:** Facilitating seamless collaboration and information sharing between different user groups fosters more efficient disaster preparedness, response, and recovery efforts, promoting a cohesive and coordinated approach to disaster management.

### 5. USER JOURNEY MAPS

Visual representations of the user journey will illustrate:

- **Discovery:** How users encounter the app (e.g., word-of-mouth, online platforms).
- **Emotional Responses:** Emotional responses to disaster events (anxiety, uncertainty, need for information).
- **Pain Points:** Difficulties in accessing relevant information, coordinating with others, and taking appropriate actions during emergencies.
- **App Intervention:** Opportunities for the app to provide real-time updates, facilitate community collaboration, and offer post-disaster support.

### 6. RECOMMENDATIONS

Based on our research findings, we recommend:

- **Prioritizing Accessibility:** Develop features that enhance accessibility, usability, and relevance

for diverse user groups.

- **Community Feedback & Localization:** Integrate community feedback mechanisms and localization strategies to resonate with Cameroon's cultural and linguistic diversity.
- **Stakeholder Collaboration:** Collaborate with local stakeholders (government, NGOs, community leaders) to promote app adoption and usage.

User research underscores the importance of understanding user needs and contexts for effective disaster management solutions. By incorporating insights from diverse user groups, we can develop a more inclusive and impactful app that supports Cameroonians in preparing for and responding to disasters. Moving forward, we will integrate these findings into the app development process to create a solution that truly serves the needs of our target users and contributes to community resilience in Cameroon.



## 1.3. FUNCTIONAL REQUIREMENTS DISASTER MANAGEMENT SYSTEM

### 1.3.1 INTRODUCTION:

Functional requirements, in a nutshell, are specific, detailed descriptions of what a system or software must do to meet its intended purpose. They outline the essential functions, features, and behaviors that the system needs to exhibit to fulfill its objectives.

The functional requirements for a disaster management system is aimed at facilitating quick response to emergencies by leveraging user registration, volunteer engagement, and feedback mechanisms. The system encompasses features such as user registration, alert creation, volunteer notification, and post-emergency feedback.

To generalize the requirements functional requirements, we can abstract the functionalities into broader categories that encapsulate the core capabilities needed for effective emergency response and management.

### 1.3.2 USER MANAGEMENT:

#### REGISTRATION AND AUTHENTICATION:

- Users should be able to register using their phone numbers and authenticate via OTP sent through SMS.
- Upon registration, users can create a username for login purposes.
- Registered users should have the ability to log in using their credentials.

### 1.3.3 EMERGENCY REPORTING AND RESPONSE:

#### ALERT CREATION AND MANAGEMENT:

- Users can create different types of alerts for general emergencies and personalized situations.
- Ability to input emergency texts or initiate emergency calls directly from the system.
- Provide guidance through a first aid screen for immediate actions during emergencies.

## FRIENDS AND FAMILY COMMUNICATION:

- Users can manage a contacts list for friends and family within the system.
- During emergencies, users can mark themselves as "safe" to reassure their contacts.

## 1.3.4 NOTIFICATION AND COMMUNICATION:

### ALERT NOTIFICATIONS

- System sends alert notifications to users via SMS, voice calls, or push notifications for real-time updates on emergencies.
- Users can opt to receive notifications for emergencies in their vicinity.

### VOLUNTEER ENGAGEMENT:

- Identify and notify nearby volunteers who have opted-in to assist during emergencies.

## 1.3.5 INCIDENT REPORTING AND FEEDBACK:

### INCIDENT REPORTING:

- Users can report incidents ranging from minor inconveniences to serious events that disrupt normal operations.

### FEEDBACK MECHANISM:

- After resolving emergencies, users can mark incidents as "solved" and provide feedback on the response.

## 1.3.6 BACKEND INTEGRATION AND AI UTILIZATION:

### AI INTEGRATION:

- Utilize AI models (such as OpenAI API or custom models) for providing first aid guidance and predictive analytics.

#### API INTEGRATION:

- Integrate with SMS APIs (e.g., MTN API) for verification and communication.
- Use audio APIs for volunteer notifications and alerts.
- Develop prediction models (e.g., LSTM recurrent neural networks) for generating emergency alerts based on data analysis.

By organizing the requirements into these generalized categories, the disaster management system can be designed to efficiently handle emergency situations, facilitate effective communication and coordination, and leverage advanced technologies to enhance response capabilities and community resilience. The specifics of implementation and technology integration will depend on the system's scope, user needs, and available resources.

## 1.4. NON-FUNCTIONAL REQUIREMENTS DISASTER MANAGEMENT SYSTEM

### 1.4.1 INTRODUCTION:

Non-functional requirements are characteristics or attributes that define how a system or software should perform rather than what it should do. They include aspects like performance, security, scalability, and usability, setting quality and operational standards for the system.

The non-functional requirements specified for a disaster management system are critical for ensuring its performance, reliability, security, usability, and integration capabilities. Some of these non-functional requirements can be classified as follows:

### 1.4.2 PERFORMANCE

#### RESPONSE TIME:

The system should respond promptly to user actions (e.g., alert creation, incident reporting) within three seconds under normal load conditions, ensuring quick and efficient interaction during emergencies.

#### SCALABILITY:

The system must be capable of handling a significant increase in user traffic during emergencies without performance degradation, ensuring that it can scale up to meet demands effectively.

### 1.4.3 RELIABILITY:

#### UPTIME:

The system should maintain a high level of uptime, with at least 99.9% availability, to ensure uninterrupted service during critical times.

#### FAULT TOLERANCE:

Implement fault-tolerant measures to withstand hardware failures and network outages, ensuring continuous operation and minimal service disruptions.

### 1.4.4 SECURITY:

#### DATA ENCRYPTION:

All user data (e.g., personal information, communication logs) should be encrypted both in transit and at rest to protect against unauthorized access and data breaches.

#### AUTHENTICATION:

Utilize secure authentication mechanisms (e.g., OTP verification, strong login credentials) following industry best practices to prevent unauthorized access to the system.

#### AUDIT TRAIL:

Maintain an audit trail of user activities for forensic analysis, aiding in the detection and investigation of security incidents.

#### 1.4.5 USABILITY:

##### ACCESSIBILITY:

Ensure the user interface complies with accessibility standards to accommodate individuals with disabilities, facilitating their effective use of the system during emergencies.

##### INTUITIVENESS:

Design an intuitive user interface with clear navigation and instructions to enhance ease of use, especially in high-stress emergency situations.

#### 1.4.6 INTEGRATION:

##### API COMPATIBILITY:

Support integration with third-party APIs (e.g., SMS verification, voice memos, prediction models) to enhance functionality and interoperability, enabling seamless communication and data exchange with external services.

#### 1.4.7 DATA INTEGRITY:

- Data Integrity Checks: Implement mechanisms to ensure data integrity, detecting and preventing data corruption or tampering to maintain the accuracy and reliability of stored information.

These non-functional requirements are essential for building a robust and dependable disaster management system that can effectively support emergency response efforts, safeguard user data and interactions, and provide a seamless user experience under challenging conditions. They form the foundation for designing and implementing a resilient and secure system capable of addressing critical needs during disasters and emergencies. Each requirement contributes to the overall performance, reliability, security, usability, and integration capabilities of the system, ensuring its effectiveness and trustworthiness in crisis situations.