International Journal of Engineering Sciences & Emerging Technologies, Oct. 2023.
ISSN: 22316604 Volume 11, Issue 2, pp: 350-358 ©IJESET

SANKAT: A COMPREHENSIVE DISASTER RESPONSE PLATFORM FOR GOVERNMENTS, VOLUNTEERS, AND VARIOUS STAKEHOLDERS

Richa Saxena, Aman Ruhela, Mohd. Suhail,
Dharmendra Pratap Singh, Himanshu Singh, Aditya Agarwal

Department of Computer Science Engineering,
Moradabad Institute of Technology, Moradabad, India
richasaxena2006@gmail.com
amanruhela36@gmail.com
mohdsuhail2232@gmail.com
dharmendrakps17@gmail.com
himanshuwhc@gmail.com
adityaagarwaludi@gmail.com

ABSTRACT

Disasters pose significant challenges to communities worldwide, requiring effective and timely response strategies. In this research paper, we present SANKAT, a comprehensive disaster management web application that aims to enhance disaster preparedness, response, and recovery efforts. The application provides functionalities such as disaster awareness, live updates, shelter location, donation system, and rehabilitation activity tracking. SANKAT is built using HTML, CSS, PHP, and MySQL, offering a user-friendly interface and leveraging technology to empower individuals and organizations in disaster-prone areas.

KEYWORDS: *Automation, Disaster Management, Web Application, Disaster Preparedness, Shelter Location, Donation System, Rehabilitation Activity Tracking.*

1. INTRODUCTION

Disasters, whether natural or man-made can have devastating consequences on communities and infrastructure. Effective disaster management systems are crucial to mitigate their impact and ensure timely response and recovery. However, many existing approaches face challenges such as inadequate communication channels, limited real-time updates, and insufficient coordination among stakeholders. In this research paper, we present SANKAT, a comprehensive disaster management web application that addresses these challenges by offering a centralized platform leveraging technology to improve disaster management efforts.

The Disaster Management Platform presented in this research paper aims to provide a comprehensive solution for effective disaster mitigation and response. With features such as live weather status, government weather alerts, and dedicated dashboards for local administrators, the platform serves as a centralized hub for information sharing and collaboration among stakeholders. Leveraging technologies such as HTML, CSS, React, JavaScript, payment APIs, Python scripting APIs, and maps and weather APIs, the platform enhances disaster management capabilities while promoting public engagement and facilitating timely assistance. Sankat here stands for 'Strategic Aid Network for Keeping All Territories safe'.

2. LITERATURE SURVEY

Extensive research has been conducted in the field of disaster management, focusing on various aspects such as disaster preparedness, response, and recovery[1,2]. Existing literature emphasizes the importance of timely information dissemination, community engagement, and resource allocation during disasters.

However existing disaster management systems often lack integrated functionalities and fail to provide seamless collaboration among stakeholders. Through a thorough review of related research papers and projects, it is evident that a comprehensive platform incorporating live weather status, government alerts, administrative dashboards, and volunteer registration can significantly enhance disaster response efforts. Moreover, adherence to established standards, ensures reliability, interoperability, and adherence to best practices. Numerous studies have focused on the shortcomings of traditional disaster management systems. Many of these systems lack integration and fail to provide a holistic approach to disaster response. They often operate in silos, resulting in fragmented information flow and limited collaboration among stakeholders. Such limitations hinder the efficient allocation of resources and impede timely decision-making during critical situations.

Research has emphasized the importance of real-time situational awareness and access to accurate and up-to-date information during disasters. By incorporating live weather status and government alerts, our proposed Disaster Management Platform aims to bridge this gap. Real-time weather updates enable users to stay informed about changing conditions, facilitating proactive decision-making and enhancing preparedness.

Collaboration among different agencies and stakeholders is a crucial aspect of effective disaster management[3]. However, existing systems often lack integrated communication channels, hindering seamless coordination. Our platform addresses this limitation by providing dedicated dashboards for local administrators. These administrators, representing state or city disaster relief departments, can update essential information, communicate with each other, and share files. The collaboration features enhance interagency coordination and facilitate the efficient allocation of resources.

The involvement of volunteers is crucial during disaster response. Previous research has emphasized the need for an efficient volunteer management system. Our platform includes a volunteer registration feature that enables NGOs and individuals to register their offerings, such as shelter, food, or other resources. This facilitates efficient matching of available resources with the needs of affected communities, optimizing the utilization of volunteer support.

Transparency and tracking of recovery efforts are essential for post-disaster management. Existing systems often lack comprehensive tracking mechanisms to monitor infrastructure redevelopment and population relocation progress. Our platform addresses this gap by providing a dedicated recovery tracking page that offers transparency and real-time updates on recovery initiatives. This promotes accountability, fosters trust, and enables stakeholders to assess the progress made in post-disaster recovery.

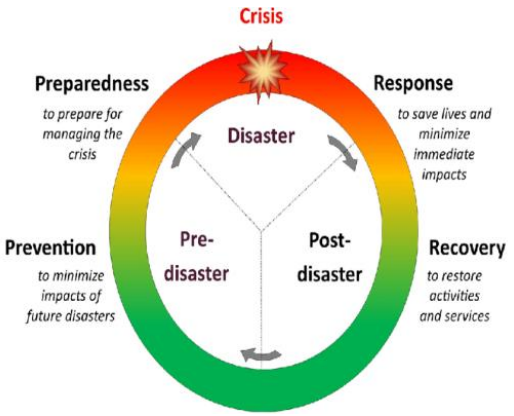

Figure 1. Response to a Disaster
Source: Surveys in Geophysics, Published by Springer Nature

Several studies have highlighted the role of technology in enhancing disaster management efforts [4,5], including the use of web applications for real-time updates, communication, and coordination. SANKAT builds upon this body of knowledge by incorporating key functionalities necessary for effective disaster management.

3. TECHNOLOGIES USED

The successful deployment and operation of SANKAT require the following technologies:

- Computer or server to host the web application.
- Sufficient processing power and memory to handle user requests.
- Stable internet connection for real-time updates and data exchange

Description of software technologies**:**

- Operating system (e.g., Windows, Linux) compatible with the web server software
- Web server software (e.g., Apache, Nginx)
- PHP interpreter to execute server-side scripts
- MySQL database management system
- HTML and CSS for frontend design and user interface
- JavaScript for client-side interactivity (optional)

HTML (Hypertext Markup Language) is the standard markup language used for creating the structure and content of webpages. It provides a foundation for organizing and presenting information on the Disaster Management Platform.

CSS: CSS (Cascading Style Sheets) is used to enhance the visual appearance of the Disaster Management Platform. It provides styling and layout capabilities, allowing us to customize the colors, fonts, spacing, and overall design of the webpage.

React: React is a JavaScript library used for building user interfaces. It provides a component-based approach, enabling the development of reusable and modular UI elements. React's virtual DOM (Document Object Model) efficiently updates and renders components, enhancing the performance and responsiveness of the Disaster Management Platform. Its component-driven architecture simplifies development, maintenance, and future scalability.

JavaScript: JavaScript is a versatile programming language used to add interactivity and dynamic functionality to webpages. In the Disaster Management Platform, JavaScript is employed to handle user interactions, perform data validations, manipulate the DOM, and make asynchronous requests to server APIs. JavaScript enables the implementation of features such as live updates, form validations, interactive maps, and chat functionalities, enhancing the user experience and engagement.

Payment APIs: Payment APIs (Application Programming Interfaces) facilitate secure and seamless online transactions. By integrating payment APIs into the Disaster Management Platform, we enable individuals to donate directly to the government's disaster funds. These APIs handle payment processing, ensuring the privacy and security of financial transactions while providing a convenient and trusted donation mechanism.

Python Scripting APIs: Python Scripting APIs enable interaction between the Disaster Management Platform and Python-based scripts or libraries. Python's extensive libraries and data processing capabilities are leveraged for various backend tasks such as data analysis, data manipulation, and integration with external systems. Python APIs enhance the platform's functionality by enabling advanced data processing, predictive analytics, and automated tasks.

Maps and Weather APIs: Maps and Weather APIs are used to integrate geospatial data and real-time weather information into the Disaster Management Platform. These APIs provide access to mapping services and weather data, enabling the visualization of relief shelter locations, weather conditions, and alerts. Maps and weather APIs enhance situational awareness, aid in decision-making, and provide users with relevant and up-to-date information.

4. METHODOLOGY

The development of SANKAT involved the following steps:

Requirement Analysis: Identifying the key functionalities required for an effective disaster management web application, including disaster awareness, live updates, shelter location, donation system, and rehabilitation activity tracking.
Design and Prototyping: Creating the overall architecture and design of the application, including the user interface, database schema, and system flow. Prototypes were developed to validate the design and gather user feedback[10].
Frontend Development: Implementing the frontend using HTML and CSS to create an intuitive and visually appealing user interface. JavaScript was utilized for client-side interactivity, enhancing the user experience.
Backend Development: Implementing the backend using PHP to handle data processing, user authentication, and interaction with the MySQL database. APIs and libraries were utilized for functionalities such as geolocation and real-time updates.
Database Implementation: Designing and implementing the MySQL database to store and retrieve information efficiently. Proper indexing and normalization techniques were employed to ensure data integrity and optimal performance.
Integration and Testing: Integrating the frontend and backend components, ensuring seamless communication and functionality. Rigorous testing was conducted to identify and resolve any bugs or issues.
The Disaster Management Platform is designed to meet specific system requirements and specifications. The platform's architecture includes a frontend interface developed using HTML, CSS, and React, enabling a user-friendly experience. The backend utilizes JavaScript and Python scripting APIs for data management and integration with external systems. Additionally, payment APIs facilitate seamless and secure donation transactions. The platform leverages maps and weather APIs to provide real-time weather updates, geospatial visualization, and tracking functionalities.
Key Features of the Disaster Management Platform:

1. *Live Weather Status and Government Alerts:* The platform integrates weather APIs to display real-time weather[6] conditions and alerts issued by government agencies, enabling users to stay informed and prepared.
2. *Administrative Dashboards*: Local administrators, representing state or city disaster relief departments, have dedicated dashboards to update and share essential information with the public. They can update shelter locations, resource requirements, and collaborate with other administrators through chat and file sharing functionalities.
3. *Donation Portal*: The platform includes a secure payment gateway that allows individuals to donate directly to the government's disaster funds, promoting financial contributions for disaster management efforts.
4. *Volunteer Registration*: NGOs and individuals can register as volunteers, listing their available resources such as shelter, food, or other assistance. This facilitates efficient coordination between volunteers and affected communities.
5. *Relief Shelter and Volunteer Map*: The platform features a user-friendly map interface displaying relief shelter locations and available volunteer assistance, enabling users to locate nearby resources during disasters.
6. *Recovery Tracking*: A dedicated page tracks infrastructure redevelopment, population relocation, and other recovery initiatives post-disaster[7,8,9], providing transparency and progress updates.

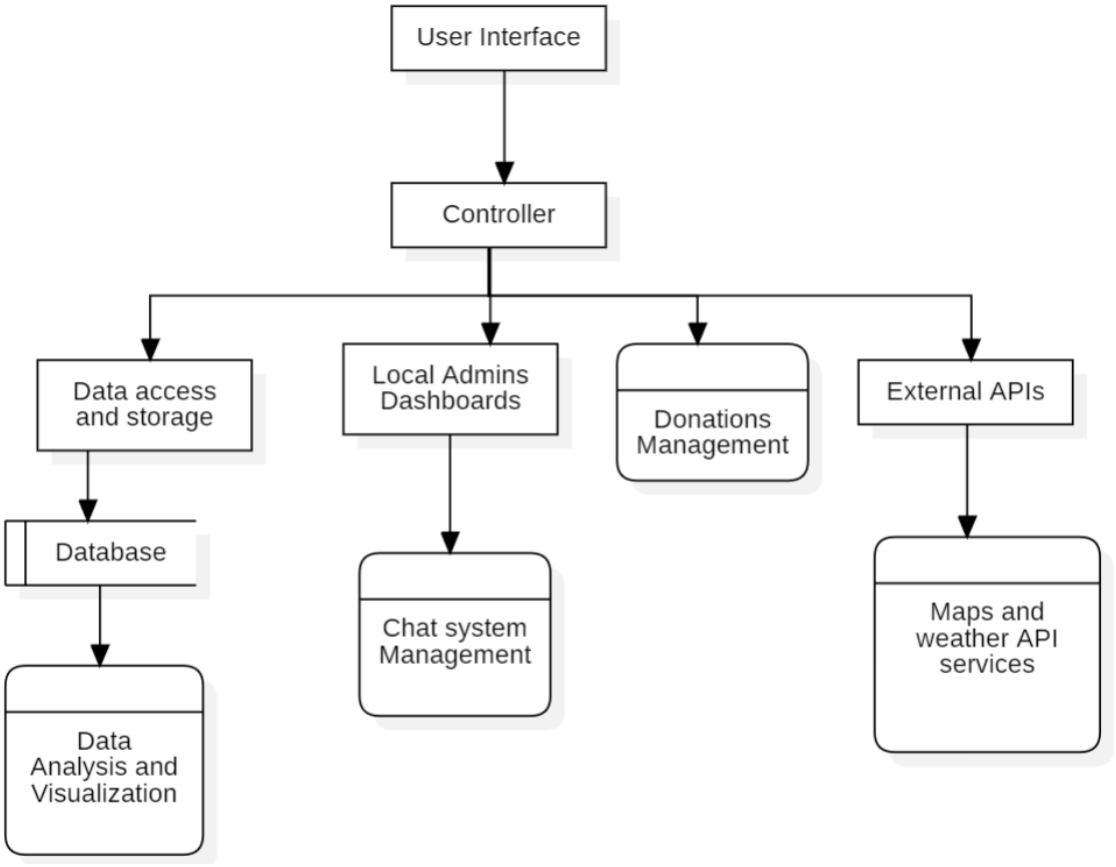

Figure 2: Flow diagram for the disaster management platform

5. RESULTS AND DISCUSSION

The implementation of SANKAT as a comprehensive disaster management web application has shown promising results. The application offers a user-friendly interface, enabling individuals to access disaster precautionary tips, receive live updates, locate nearby shelters, contribute to rehabilitation efforts through the donation system, and track the progress of rehabilitation activities.

As can be seen in Figure 3, a very simple and user-friendly UI has been designed so that anyone can use the platform in time of need. Figure 5 shows how easily anyone can search for weather reports and Figure 6 shows a comprehensive analysis of recovery efforts and updates, for a disaster hit area.

Dedicated chat portal for the collaboration of local admins has been deployed, where they can share text and various file formats, as shown in Figure 7.

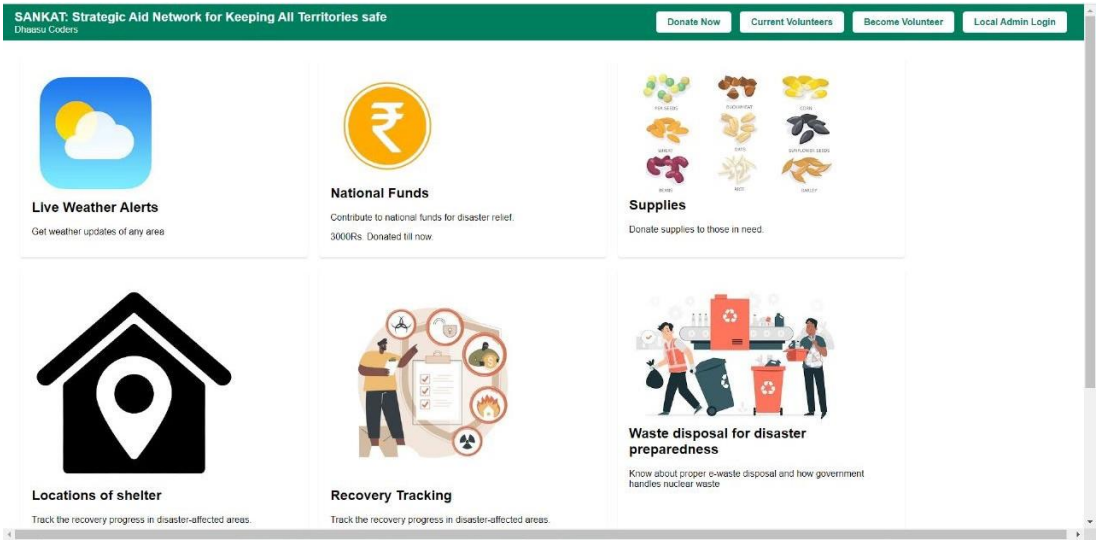

Figure 3: Landing page of the platform

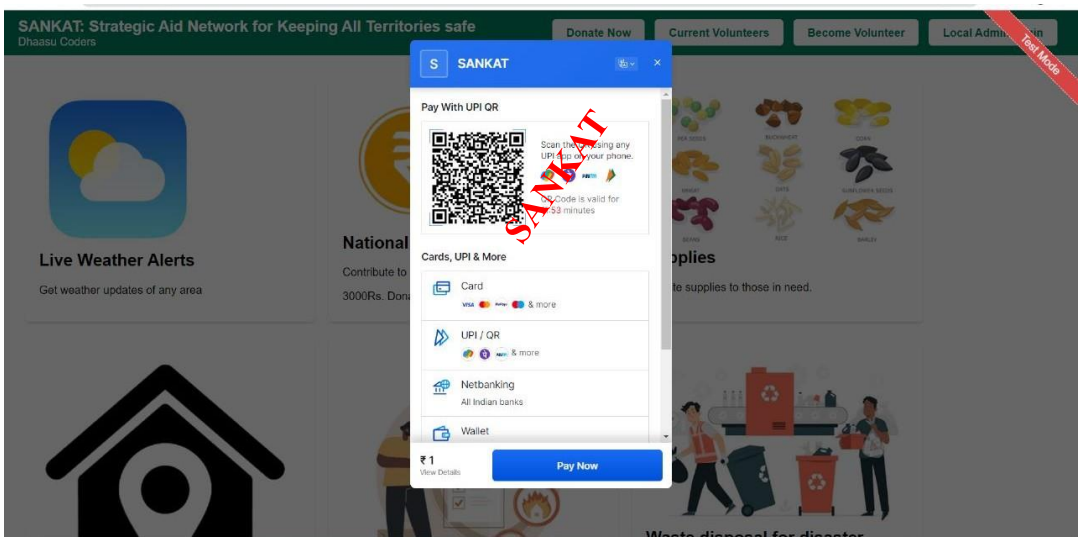

Figure 4: Donations system

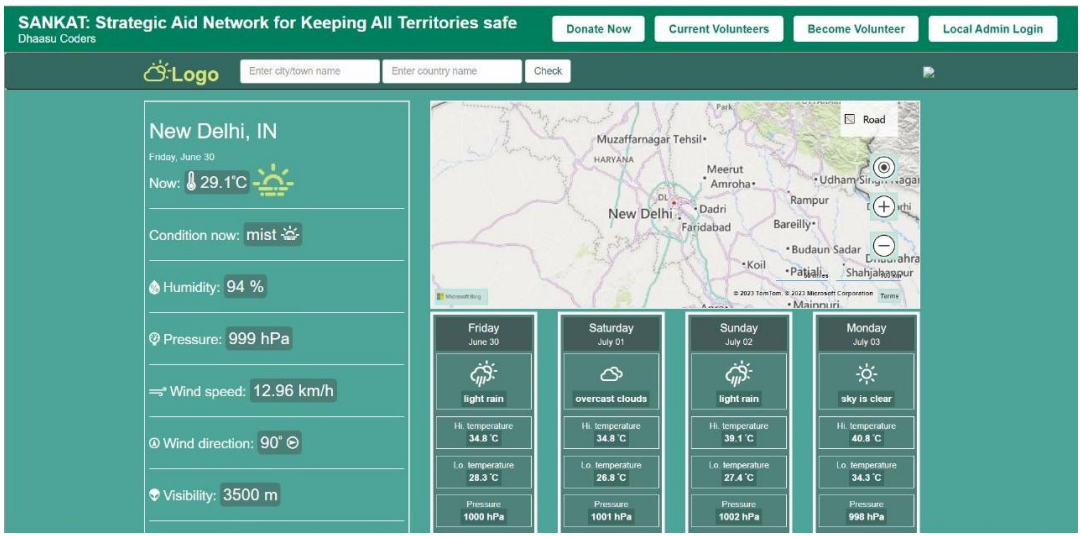

Figure 5: Weather updates and alerts

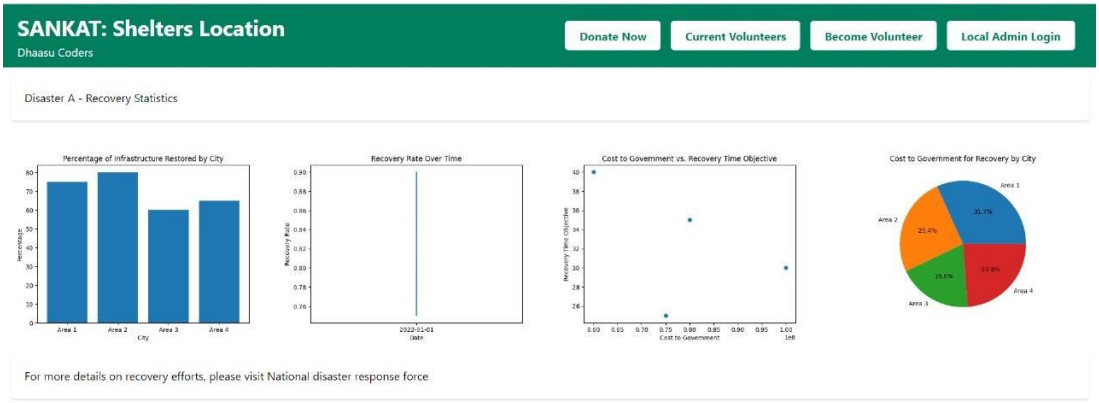

Figure 6: Recovery Statistics

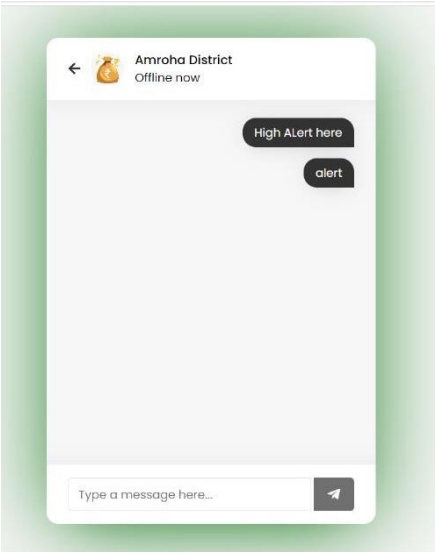

Figure 7: Chat system for local Admins

6. CONCLUSION

In this research paper, we presented SANKAT, a comprehensive disaster management web application that addresses the challenges faced in effective disaster management. By leveraging HTML, CSS, PHP, and MySQL, SANKAT offers a user-friendly interface and a range of functionalities to enhance disaster preparedness, response, and recovery efforts. The application empowers individuals and organizations in disaster-prone areas, facilitating real-time updates, shelter location, donation management, and rehabilitation activity tracking. SANKAT represents a significant step towards improving disaster management systems and ensuring the resilience of communities in the face of disasters.

The developed Disaster Management Platform serves as a robust solution for disaster mitigation and response. By leveraging technologies such as payment APIs, Python scripting APIs, maps, and weather APIs, the platform enables effective collaboration, real-time information dissemination, and public engagement. Future enhancements may include incorporating advanced data analytics, to enhance public awareness and participation in disaster management efforts.

Overall, the Disaster Management Platform demonstrates the potential to revolutionize disaster management practices, ensuring timely and efficient response while fostering community resilience and support.

REFERENCES

[1] Gehbauer, F & Markus, Michael & Engelmann, H & Popa, Ion & Schweier, C & Rehor, M & Werder, Stefan. (2007). The Disaster Management Tool (DMT).
[2] V. Rathore, Technology in Disaster Management and Disaster Risk Reduction: A Review of Applications, Journal of Environment and Earth Science. ISSN 2224-3216 (Paper) ISSN 2225-0948 (Online). Vol.6, No.4, 2016
[3] National Disaster Management Division/MHA/GOI/28/06/2004
[4] Pardeep Sahni Madhavi malalgoda and ariyabandu "Disaster risk reduction in south asia", PHI
[5] Frassl, Martin & Lichtenstern, Michael & Angermann, Michael. (2012). Disaster Management Tool (DMT) - Usability Engineering, System Architecture and Field Experiments. 953.
[6] Okpanachi, G., "Satellite Application for Disaster Management Information Systems", vol. 40, 2014.
[7] Cheikhrouhou, O.; Koubaa, A.; Zarrad, A. A Cloud Based Disaster Management System. *J. Sens. Actuator Netw.* **2020**, *9*, 6. https://doi.org/10.3390/jsan9010006
[8] B. Shneiderman and C. Plaisant. Designing the user interface : strategies for effective human-computer interaction. Addison-Wesley, 2010
[9] M. Frassl, M. Lichtenstern, M. Khider, and M. Angermann. Developing a system for information management in disaster relief - methodology and requirements. In Proceedings of the International Community on information systems for crisis response and management (ISCRAM 2010), Seattle, Washington, USA, 2010.
[10] Baumeister, J., Agile development of Diagnostic Knowledge Systems. DISKI 284, IOS Press, ISBN: 978-1-58603-463-4, 2004.

AUTHORS

Richa Saxena received her M. Tech degree in Computer Science & Engineering in 2013 from TMU. She is currently an Assistant Professor in the CSE Department at MIT with 14 years of professional experience. She has wide expertise in Cloud Computing with a strong background in Networking. Ethical Hacking. Python. IoT and has completed several STCs from NITTTR. Chandigarh and FDP's workshops and trainings from various recognized organizations**.**

Aman Ruhela is an undergraduate Computer Science Student at Moradabad Institute of Technology, Moradabad. He is an experienced android and flutter developer. Having worked in the field of app development, he has real world experience of software field. His skills include Web Dev, flutter, Java, Php and SQL.

Mohd. Suhail is a full stack web developer and python programmer. He is a machine learning and data science enthusiast currently pursing Bachelors of Technology in Computer Science at MIT, Moradabad. He has worked on various projects touching the domains of IOT and Full Stack. He is experienced with working in teams and dealing with deadlines on a regular basis.

Dharmendra Pratap Singh, currently an undergraduate B. Tech student at MIT, Moradabad studying Computer Science & Engineering is a passionate aspiring engineer with deep interest in Cloud Technology, Operating Systems and Architecture and Software Engineering. He has been part of numerous projects, working on full stack and cloud deployment.

Himanshu Singh is a passionate web developer currently pursuing a B.Tech in Computer Science and Engineering. He specializes in front-end development using React, where he creates responsive and interactive user interfaces. On the back-end, he is proficient in Node.js and Express.js. Also having strong programming skills in C++ and Python, he is dedicated, motivated, and continuously seeking to expand my knowledge in web development

Aditya Agarwal is a student at MIT, Moradabad pursuing B. Tech in Computer Science and engineering. He is deeply interested in technologies like Data Science, Machine Learning and network security and has worked on numerous projects touching these fields. He has done certifications in Machine learning and aspires to explore more in these emerging technologies.