



Development of a Multi-Agency Incident Reporting System

¹Shehu Zara'u, ²Hassan Maharazu, ³Usman Bara'u Musa, ⁴Abubakar Muktar, ⁵Abdullahi Abdulaziz, ⁶Abubakar Ahmad

¹Department of Computer Science, Nigeria Defence Academy, Kaduna State, Nigeria

^{2,3&4}Department of Electrical and Electronics Engineering, Federal University of Transportation, Katsina State, Nigeria

⁵Department of Computer Engineering, Ahmadu Bello University, Zaria Kaduna State, Nigeria

⁶Department of Mathematics and Statistics, Nigeria Defence Academy, Kaduna State, Nigeria

ABSTRACT

This research presents the development of a Multi-Agency Mobile Incident Reporting and Emergency Social Awareness System aimed at addressing the persistent complexities and inefficiencies in contemporary incident management. The study underscores the importance of inter-agency collaboration and leverages modern mobile and cloud-based technologies to optimize emergency response operations and strengthen public safety. Existing incident reporting frameworks are often hindered by fragmentation, manual workflows, and outdated infrastructures, resulting in delayed response times, duplicated efforts, poor resource coordination, and limited situational awareness. To overcome these challenges, the proposed system integrates real-time data collection, cross-agency interoperability, and intelligent analytics to support rapid decision-making and coordinated action. The solution incorporates a unified mobile platform that enables citizens and field responders to report incidents efficiently, while agencies can seamlessly share information through a secure, scalable backend architecture. Additionally, embedded social awareness features and automated data processing enhance communication, support community engagement, and improve the accuracy of situational assessments. By combining mobile technology, multi-agency integration, and data-driven insights, this research advances the field of emergency management and offers a transformative approach for improving public safety outcomes in rapidly evolving incident environments.

ARTICLE INFO

Article History

Received: December, 2025

Received in revised form: December, 2025

Accepted: February, 2026

Published online: March, 2026

KEYWORDS

Multi-Agency Incident, Mobile Emergency Reporting Systems, Real-Time Data Integration, Interoperability in Public Safety, Social Awareness Technologies

INTRODUCTION

The modern world is characterized by an increasing frequency of incidents, encompassing crimes, accidents, and natural disasters, which pose substantial challenges to both public safety and emergency response mechanisms. Considering this, the development of a comprehensive, multi-agency mobile incident reporting and emergency social awareness system has emerged as a critical imperative in recent years. Such a system integrates various technological components to streamline the process of reporting incidents, enhance

collaboration among agencies, and engage the public in real-time emergency awareness.

The rise of mobile technology, particularly the proliferation of smartphones, has significantly altered the landscape of incident reporting. Mobile applications and smart devices have become indispensable tools for individuals, enabling them to report incidents promptly and accurately. The use of mobile devices offers the advantage of real-time data collection, including photos and videos, as well as GPS location data. This technology has the potential to transform how incidents are reported, providing a foundation for

Corresponding author: Shehu Zara'u

zarushehuabdu@gmail.com

Department of Computer Science, Nigeria Defence Academy, Kaduna State, Nigeria.

© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved



improved response times and enhanced incident management (Khushboogoyal, 2021).

Effective incident management often requires the collaboration of multiple agencies, including law enforcement, fire departments, medical services, and more. Unfortunately, existing incident reporting systems often suffer from a lack of interoperability and collaboration, leading to delays and inefficiencies (FEMA, 2018). In response to this challenge, a multi-agency approach is being increasingly recognized as an essential component in incident reporting systems. The capacity for these agencies to share information seamlessly and coordinate efforts ensures a more efficient response to incidents. Furthermore, the integration of geographic information systems (GIS) has become a fundamental component in modern incident reporting and emergency awareness systems. GIS technology enables the collection, storage, and visualization of geographic data, enhancing the spatial understanding of incidents (Aldo, 2023). This technology facilitates location tracking, resource allocation, and situation assessment, contributing to effective emergency response.

Moreover, the emergence of social media and the increased reliance on online communication platforms have redefined public awareness and crisis communication during incidents. Social media platforms like twitter have become integral in disseminating real-time incident information, enabling safety check-ins, and as also providing a channel for the public to report incidents. The challenge lies in integrating social media data into incident reporting systems effectively and responsibly.

In summary, the development of a multi-agency mobile incident reporting and emergency social awareness system is a response to the evolving landscape of incident reporting and emergency management. The integration of mobile technology, multi-agency collaboration, GIS, and social media into a unified system holds the potential to revolutionize how incidents are reported, managed, and communicated to the public. However, it requires careful consideration of technological, security, and ethical aspects to

ensure its effectiveness and reliability in safeguarding public safety and enhancing emergency awareness.

Problem Statement

In the contemporary era, characterized by the increasing frequency of incidents, encompassing crimes, accidents, and natural disasters, there exists a pressing need for a transformative solution in the domain of incident reporting and emergency social awareness. Despite the technological advancements in mobile devices, the integration of multi-agency collaboration, geographic information systems (GIS), and social media platforms, several critical challenges and gaps persist within the existing incident reporting landscape.

Current incident reporting systems often lack integration among agencies, leading to delays in response times. The absence of a unified platform hinders the prompt collection, analysis, and dissemination of critical incident data. These inefficiencies compromise the timeliness and effectiveness of incident response. Reports indicate that many incident reporting systems are outdated and rely on manual processes and disconnected databases. Such outdated systems hinder not only the speed of response but also the accuracy and completeness of incident data (Adrian, 2022). Effective incident response necessitates collaboration among multiple agencies, yet existing systems often suffer from a lack of interoperability (FEMA, 2018). The failure to coordinate efforts and share information seamlessly leads to resource allocation challenges, duplication of efforts, and suboptimal incident management.

In light of these challenges, the overarching problem addressed by this study is the need for the development of a comprehensive, multi-agency mobile incident reporting and emergency social awareness system that allows for the prompt reporting of incidents, streamlines multi-agency collaboration, enables efficient data integration and analysis, upholds user privacy, and ensures cost-effective scalability. Mitigating these challenges and creating a unified, technologically advanced system is essential to revolutionize incident reporting and emergency

Corresponding author: Shehu Zara'u

zaraushehuabdu@gmail.com

Department of Computer Science, Nigeria Defence Academy, Kaduna State, Nigeria.

© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved



management, enhancing public safety and awareness in the modern age.
 Methodology

System Flow Chart

The system flow chart delineates a streamlined process for incident management, beginning with the reception of incident reports. The initial step involves categorizing the incident type in the second stage, determining the nature of the reported event. Subsequently, in step three, the system intelligently notifies the pertinent agency based on the incident type. Crimes, for instance, are directed to both the police and the NSCDC (Nigeria Security and Civil Defense Corps), fostering a collaborative approach to law enforcement. Accidents find their way to the FRSC (Federal Road Safety Corps), leveraging specialized expertise in traffic-related incidents.

Natural disasters prompt notifications to NEMA (National Emergency Management Agency), ensuring a swift and tailored response to mitigate the impact of such events in Nigeria. Following this notification process, step four entrusts the identified agency with the pivotal responsibility of containing and managing the situation. This systematic flow chart as seen in figure 3.1, not only ensures a prompt and efficient incident response but also optimizes resource allocation by directing specific incidents to the agencies best equipped to address them, exemplifying a tailored and collaborative approach to incident management.

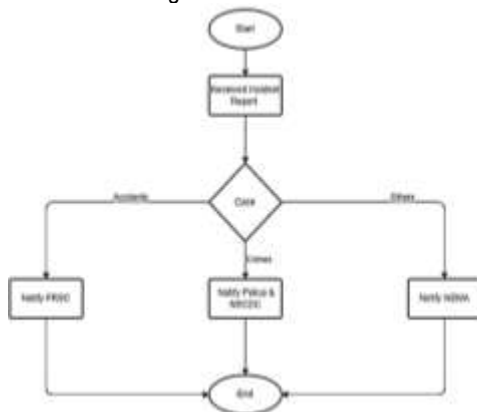


Figure: 1 Flow chart for the proposed Incident Reporting System. (Visual Paradigm, 2024)

System Architecture Diagram

The system's architectural design is intricately crafted to facilitate a seamless flow of incident information. Initiated by an Android mobile app, incident reports are efficiently transmitted to a Firebase database in the first leg of this design. Firebase serves as a robust and real-time storage solution, ensuring the secure and instantaneous reception of incident data. Simultaneously, the system orchestrates notifications to the monitoring agency, leveraging Firebase's notification capabilities to ensure swift awareness and responsiveness. Moving forward, the system dynamically connects with the twitter server, a pivotal component for broader public awareness.

Through a well-defined integration, incident updates are relayed to a dedicated twitter page, offering a public-facing platform for real-time information dissemination. Figure 3.2 shows the architectural design, characterized by its efficient data flow and integration with Firebase and twitter, not only centralizes incident reports but also ensures a multipronged communication strategy. By seamlessly bridging the gap between mobile reporting, agency awareness, and public outreach, the system establishes a comprehensive and effective framework for incident management and emergency social awareness.

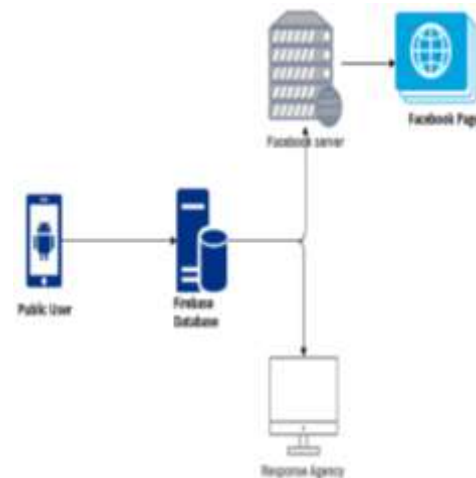


Figure 2 Architectural diagram (Visual Paradigm, 2024)

Corresponding author: Shehu Zara'u

zarushehuabdu@gmail.com

Department of Computer Science, Nigeria Defence Academy, Kaduna State, Nigeria.

© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved



Splash Activity

The splash activity serves as the inaugural experience upon launching the app, functioning as an introductory interface. Its primary role is to present an initial title and credit to the developer, setting the tone for the user's engagement. Beyond its informative purpose, the splash activity operates as a loading page, providing a seamless transition into the app's core functionalities. This brief yet impactful screen offers users a glimpse of the app's identity, acknowledging the developer's contribution, and acts as a visually engaging loading screen, ensuring a smooth entry into the app's interface. The splash activity, in its dual role as an introductory showcase and loading screen, establishes an initial connection with users while preparing the app for optimal performance.

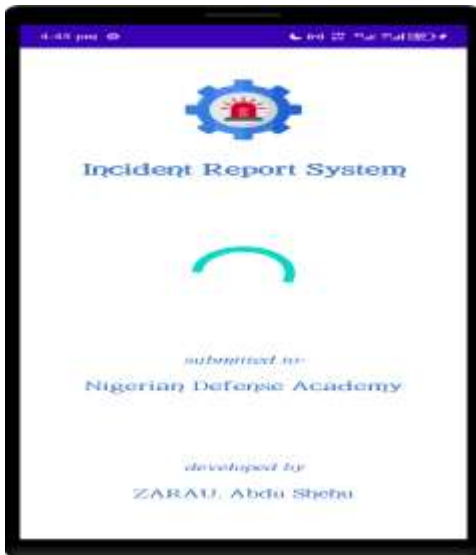


Figure: 3 splash Screen (Android Studio, 2023)

RESULTS

Phone Signup Activity

The bedrock of user engagement within the system lies in its robust authentication process. Item 2 delves into the intricacies of user authentication, highlighting the utilization of Firebase's phone number authentication page. Leveraging Firebase's secure and user-friendly

authentication mechanism, users are seamlessly verified through their phone numbers. This not only establishes a trustable user base but also ensures that only authorized individuals can engage with the incident reporting and emergency awareness functionalities of the system. The integration of Firebase's phone number authentication elevates the system's security, offering a streamlined onboarding process for users.

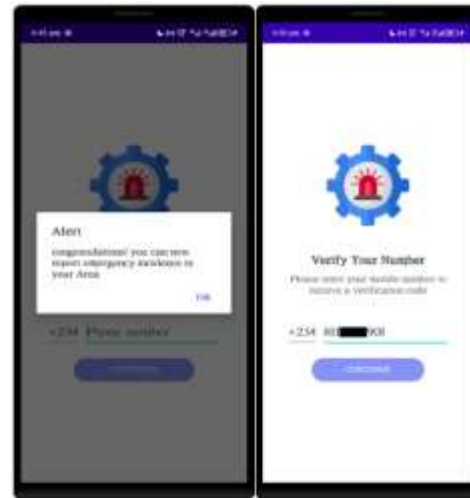


Figure: 4 Phone Signup Activity (Android Studio, 2023)

OTP Verification

This step unveils a critical layer of security within the authentication process: One-Time Password (OTP) verification. This additional step acts as a bulwark against unauthorized access, requiring users to verify their identity through a unique and time-sensitive OTP. The system's commitment to user security is encapsulated in this feature, preventing fraudulent activities and ensuring that only legitimate users can proceed to access the system's functionalities. The OTP verification process not only fortifies the user authentication journey but also aligns with contemporary security standards, underscoring the system's dedication to safeguarding user information and maintaining the integrity of incident reports.



Figure: 5 OTP Verification Activity (Android Studio, 2023)

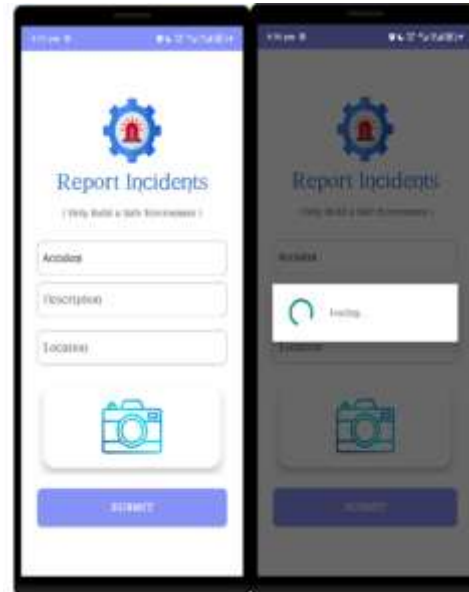


Figure: 5 Home Activity (Android Studio, 2023)

Acceleration Profile of the Truck

At the heart of the system's functionality lies the Incident Report Home Page, as elucidated in item 4. This central hub serves as the nexus for users to initiate incident reports efficiently. Through an intuitive and user-friendly interface, individuals can seamlessly navigate the incident reporting process, providing essential details regarding the nature, location, and specifics of the incident. The design of this home page is intricately woven to prioritize ease of use, ensuring that users can swiftly and effectively communicate incident information. This foundational element of the system not only streamlines the reporting process but also contributes to the system's overarching goal of prompt and informed incident response.

CONCLUSION

In conclusion, the "Development of a Multi-Agency Mobile Incident Reporting and Emergency Social Awareness System" marks a significant stride in addressing the contemporary challenges associated with incident management and public awareness. The amalgamation of Java, Android Studio, Firebase, and Twitter within the system's architecture exemplifies a thoughtful integration of cutting-edge technologies. The user-centric approach, evident in the robust authentication process and the intuitive Incident Report Home Page, ensures a seamless and secure interaction for users.

The iterative methodology, blending progressive implementation and rapid development features, underscores the adaptability and efficiency of the system. As the successful phone verification dialog symbolizes user enrollment, the project stands as a testament to technological innovation meeting the imperative needs of incident reporting. This endeavor not only advances the field of emergency awareness but also underscores the potential for responsive, collaborative solutions in the realm of public safety.



REFERENCES

- [1] Visual Paradigm, S. (2024). Visual Paradigm Flow chart maker. Web Publication. <https://online.visualparadigm.com/app/diagrams/#diagram:workspace=ulmuhgxu&proj=0&id=1&type=Flowchart>
- [2] Aaron, R. (2023). Firebase vs. Supabase vs. AWS Amplify vs. Appwrite: Comparing Backend as a Service (BaaS) Platforms. Web Article Publication. <https://aaron-russell.co.uk/blog/firebase-vs-supabase-vs-aws-amplify-vs-appwrite/>
- [3] Daria, K. (2023, July). *The Power Of Java: A Comprehensive Guide to Understanding and Using the Programming Language*. Web Article Publication. <https://fetocan.com/blog/the-power-of-java-a-comprehensive-guide-to-understanding-and-using-the-programming-language>
- [4] Google LLC. (2023). Android Studio Hedgehog | 2023.1.1 . Web Publication. https://developer.android.com/studio?_gl=1*1r9g3ei*_up*MQ..&gclid=CjwKCAiA29auBhBxEiwAnKcSqeapM-6ea7pms_c5b9JlsTmu2Kyq_ajar1b8NF8j_y_TFo7iYJMwRoCP0oQAvD_BwE&gclidsrc=aw.ds
- [5] Ralph Aran C. Cabañero. (2023). Mobile Incident Management System using React Native. *International Journal of Advanced Research in Science, Communication and Technology*, 891–897. <https://doi.org/10.48175/ijarsct-12325>
- [6] Rathod, G. S., Jajulwar, K., & Kubde, U. (2023). Machine learning-based intelligent accident detection and notification system in IoT network. *International Conference on Emerging Trends in Engineering and Technology, ICETET, 2023-April*. <https://doi.org/10.1109/ICETET-SIP58143.2023.10151583>
- [7] William, P. R., Sydney S. Alison Adalin, khristopher, R. L. C., & Gian, windsor. (2023). *Mamamayan: An Android mobile Community-based Emergency Reporting and Notification System*. <https://doi.org/10.46254/an12.20220799>
- [8] Hertelendy, A. J., Goniewicz, K., & Khorram-Manesh, A. (2020). The applications of geographic information systems in disaster and emergency management in Europe. *In Disaster and Emergency Medicine Journal* (Vol. 5, Issue 4). <https://doi.org/10.5603/DEMJ.a2020.0040>
- [9] itsoftexpert. (2020). IDE- Android Studio. Web Article Publication. <https://itsoftexpert.com/ide-android-studio/>
- [10] Keskin, I., Karacameydan, N., Tosun, M., Tüfekci, M. K., Bulut, D., Avci, F., & Gökce, O. (2019). AYDES: An All-in-One Solution for Geospatial Information Technology Based Disaster Management and Decision Support. *Lecture Notes in Geoinformation and Cartography*, 61–86. https://doi.org/10.1007/978-3-030-05330-7_3
- [11] Harrison, S., & Johnson, P. (2019). Challenges in the adoption of crisis crowdsourcing and social media in Canadian emergency management. *Government Information Quarterly*, 36(3), 501–509. <https://doi.org/10.1016/j.giq.2019.04.002>
- [12] Luna, S., & Pennock, M. J. (2018). Social media applications and emergency management: A literature review and research agenda. *International Journal of Disaster Risk Reduction*, 28, 565–577. <https://doi.org/10.1016/j.ijdrr.2018.01.006>
- [13] Fanca, A., Puscasiu, A., Valean, H., & Folea, S. (2018). A survey on smartphone-based accident reporting and guidance systems. *International Journal of Advanced Computer Science and Applications*, 9(9). <https://doi.org/10.14569/ijacsa.2018.090952>
- [14] Tian, H., & Chen, S. C. (2017). A Video-Aided Semantic Analytics System for Disaster Information Integration. *Proceedings - 2017 IEEE 3rd International Conference on Multimedia Big Data, BigMM 2017*, 242–243. <https://doi.org/10.1109/BigMM.2017.31>
- [15] Gratzler, A. L., Thormann, S., Schirrer, A., & Jakubek, S. (2022a). String Stable and Collision-Safe Model Predictive Platoon Control. *IEEE Transactions on Intelligent Transportation Systems*, 23(10), 19358–19373. <https://doi.org/10.1109/TITS.2022.3160236>
- [16] methods. In *Annual Reviews in Control* (Vol. 47, pp. 81–97). Elsevier Ltd. <https://doi.org/10.1016/j.arcontrol.2019.03.001>
- [17] Une, H., & Nakano, T. (2018). Recent innovation of geospatial information technology to support disaster risk management and responses. *Proceedings of the ICA*, 1. <https://doi.org/10.5194/ica-proc-1-117-2018>

Corresponding author: Shehu Zara'u

zarushehuabdu@gmail.com

Department of Computer Science, Nigeria Defence Academy, Kaduna State, Nigeria.

© 2026. Faculty of Technology Education. ATBU Bauchi. All rights reserved