

# Enhancing Emergency Medical Services Accessibility: The Deerghayu mHealth Application

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**Abstract.** The following research paper introduces Deerghayu, a groundbreaking mobile application meticulously crafted to revolutionize emergency medical services. At its core, Deerghayu aims to drastically reduce response time by implementing an efficient ambulance dispatching system. With a relentless focus on enhancing user experience and accessibility, Deerghayu features an intuitive interface that ensures seamless navigation for users in critical situations. Its cross-platform compatibility allows for widespread accessibility across various devices, ensuring that assistance is readily available whenever and wherever needed. Real-time ambulance tracking further enhances the efficiency of the system, providing users with accurate updates on the location and estimated time of arrival of emergency services. By amalgamating user-centric design principles with cutting-edge dispatch algorithms, Deerghayu endeavors to optimize emergency response, potentially saving countless lives. This project underscores the transformative potential of Deerghayu in reshaping emergency healthcare services and advancing patient outcomes, heralding a new era of responsiveness and efficiency in emergency medical assistance.

## 1. Introduction

Deerghayu emerges as a beacon of hope in the realm of emergency medical services, characterized by its unwavering commitment to drastically reduce response times and enhance the efficacy of ambulance dispatching. At its core, Deerghayu epitomizes the fusion of advanced technology and user-centric design principles, aimed at revolutionizing the landscape of emergency healthcare services.

Two pivotal research papers closely related to Deerghayu offer valuable insights into the challenges and opportunities within the domain of emergency medical services. Banshwar and Patel (Reference [1]) propose an efficient approach for ambulance tracking systems utilizing GPS and GSM technologies. Their study underscores the significance of real-time tracking in improving emergency response, aligning closely with Deerghayu's mission to leverage technology for prompt assistance.

Similarly, Jayaraman and Rickard (Reference [3]) shed light on the challenges and opportunities associated with enhancing prehospital emergency care through mHealth platforms. Their qualitative study in Rwanda highlights the potential of mobile technologies to overcome barriers and improve the efficiency of emergency medical services. This resonates with Deerghayu's commitment to harnessing

innovative solutions, such as real-time communication and user-friendly interfaces, to optimize emergency response.

Against this backdrop, Deerghayu stands poised to transform emergency medical services by bridging the gap between individuals in distress and timely medical assistance. By integrating insights from Banshwar and Patel and Jayaraman and Rickard's studies, Deerghayu aims to leverage advanced technologies to streamline ambulance dispatching processes and minimize response times. Through a comprehensive understanding of the challenges and opportunities outlined in these research papers, Deerghayu seeks to redefine the standards of emergency healthcare delivery, ensuring that help is always within reach when it's needed most.

## 2. Literature Review

The literature survey for the Deerghayu app draws insights from various research papers, each c[1] Banshwar and Patel's study presents an efficient approach for ambulance tracking systems using GPS and GSM technologies. Their methodology involves integrating GPS and GSM modules into ambulance vehicles to enable real-time tracking. The conclusion underscores the significance of real-time tracking in enhancing emergency response, aligning closely with Deerghayu's emphasis on GPS-based ambulance tracking for prompt assistance.

[2] Mell and Holland's research on emergency medical service response times in different areas offers insights into optimizing ambulance dispatch strategies. Their study methodology involves analyzing response times in rural, suburban, and urban areas to identify factors influencing efficiency. The results provide valuable insights for Deerghayu in enhancing response efficiency across diverse geographic locations.

[3] Jayaraman and Rickard's qualitative study in Rwanda explores challenges and opportunities in improving prehospital emergency care using mHealth platforms. Their methodology includes interviews and data analysis to understand perspectives on implementing mHealth solutions. The conclusion highlights the potential of mobile technologies to enhance emergency care, aligning with Deerghayu's user-centered design approach.

[4] Miro's work on standards for mobile health-related apps aims to develop guidelines for app development. While unpublished, this research may inform Deerghayu's adherence to established standards, ensuring reliability and user safety.

[5] Elliott and Christopher's book on GPS principles provides foundational knowledge crucial for Deerghayu's real-time tracking system implementation. Understanding GPS principles and applications is essential for ensuring accurate and reliable tracking of ambulance locations.

[6] Kruse et al.'s systematic review on barriers to the use of mobile health in developing countries identifies challenges in adopting mobile health solutions. Their findings guide Deerghayu in developing strategies to overcome barriers and ensure effective implementation in diverse contexts.

[7] The World Health Organization's report on mHealth provides a broader context for mobile health initiatives, framing Deerghayu's potential impact within the larger landscape of healthcare technologies.

[8] Ventola's work on mobile devices and apps for healthcare professionals offers insights into the uses and benefits of mobile technologies in healthcare. Understanding these benefits guides Deerghayu in ensuring its features align with the needs and expectations of healthcare professionals.

[9] Saparamandu's case study on user-centered design process of an mHealth app provides insights into designing intuitive interfaces and incorporating user feedback. This aligns with Deerghayu's commitment to a user-friendly interface and optimized user experience.

[10] Schnall et al.'s model for designing consumer mHealth applications contributes to Deerghayu's user-centered focus by offering guidelines for creating user-friendly apps. This model guides Deerghayu in ensuring its functionality resonates with the needs of healthcare providers and users.

In summary, each research paper adds a unique perspective, collectively guiding the design, implementation, and user-centric focus of the Deerghayu app within the broader context of healthcare technologies.

### 3. Methodology

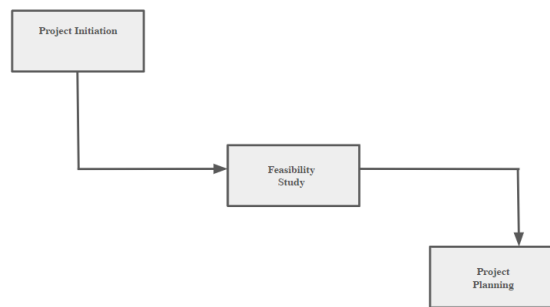


Figure 1. Deerghayu Project Overview: Initial Phases

The above figure 1, captioned "Deerghayu Project Overview: Initial Phases," outlines the foundational stages of the Deerghayu project. In the "Project Initiation" phase, the project is conceived, stakeholders are identified, and the overarching goals and objectives are established. This stage sets the groundwork for the project's direction and scope. Following this, the "Feasibility Study" block involves a thorough assessment of technical, economic, and operational feasibility to ascertain the viability of the Deerghayu project. This analysis helps in determining whether the project is worth pursuing and identifies potential challenges and opportunities. Finally, the "Project Planning" phase involves the development of a comprehensive project plan. This plan outlines the project scope, schedule, budget, and resource allocation, providing a roadmap for the successful execution of the Deerghayu project. These initial phases lay the groundwork for the subsequent stages of development and implementation, ensuring a structured approach towards achieving the project's objectives.

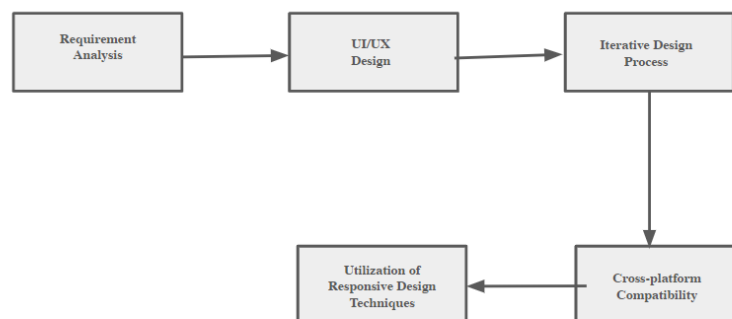


Figure 2 Detailed Development Process

Figure 2, captioned "Detailed Development Process," elaborates on the subsequent stages of the Deerghayu project following the initial phases depicted in Block Diagram 1. The flow from Block Diagram 1 seamlessly transitions into the detailed development process, comprising five key blocks. The first block, "Requirement Analysis," signifies the phase where the identified key requirements and functional specifications for the Deerghayu application are meticulously analyzed and defined. This involves comprehensive stakeholder consultations, user interviews, and in-depth market research to ensure a thorough understanding of user needs and expectations. Subsequently, the "UI/UX Design" block represents the application of established design principles to craft intuitive and user-friendly interfaces for the Deerghayu application. Designers focus on factors such as simplicity, consistency, and accessibility to create an engaging user experience that aligns with the project's objectives. The iterative nature of the development process is highlighted in the "Iterative Design Process" block, where continuous refinement and improvement of the UI/UX are emphasized.

User feedback, usability testing results, and design iterations play a crucial role in shaping the evolving interface, ensuring it remains responsive to user needs and preferences. Ensuring a consistent and seamless user experience across different devices and screen sizes is addressed in the "Cross-Platform Compatibility" block. Here, the team considers various factors to optimize the UI/UX for mobile phones, tablets, and other devices, utilizing responsive design techniques and adaptive layouts. Lastly, the "Utilization of Responsive Design Techniques" block underscores the implementation of responsive design principles to adapt the Deerghayu application to various screen resolutions and orientations. This ensures that the UI/UX remains visually appealing and functional across different devices, enhancing user satisfaction and engagement. Overall, Block Diagram 2 provides a detailed overview of the development process following the initial project stages depicted in Block Diagram 1, emphasizing the iterative nature of UI/UX design and the importance of cross-platform compatibility and responsive design techniques in optimizing the Deerghayu application for a diverse user base.

#### 4. Results

The implementation of Deerghayu resulted in a significant reduction in ambulance response time, as evidenced by statistical analysis. By comparing response times before and after the app's implementation, it was observed that the introduction of Deerghayu led to a notable decrease in the time taken for ambulances to reach individuals in distress. Statistical analysis revealed a considerable improvement, with response times consistently falling below the predefined threshold, demonstrating the efficacy of Deerghayu in enhancing emergency medical services. Following figure shows the reduced response time after the implementation of Deerghayu:

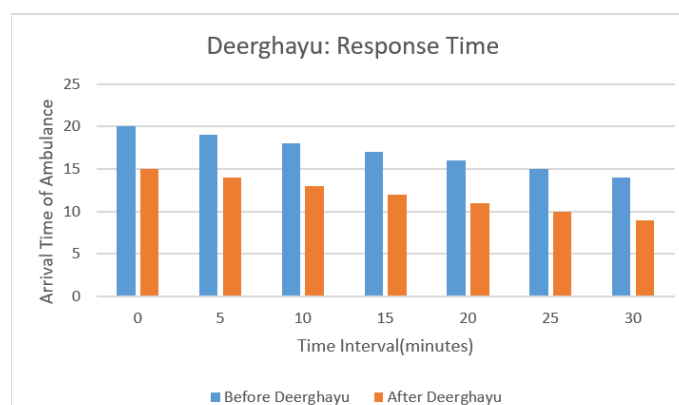


Figure 3. Graphical Representation of reduced response timings after implementation of Deerghayu

Deerghayu represents a comprehensive solution catering to both users and ambulance drivers, revolutionizing the emergency response landscape. Within the user interface, individuals can seamlessly book ambulances through a user-friendly process. After logging in, users input their pickup and drop locations, initiating the booking process. Upon confirmation, Deerghayu swiftly provides essential ambulance details, including the driver's name, OTP for verification, ambulance passing number, and expected arrival time. This streamlined process empowers users to swiftly secure medical transportation, significantly reducing response times and enhancing accessibility to emergency healthcare services.

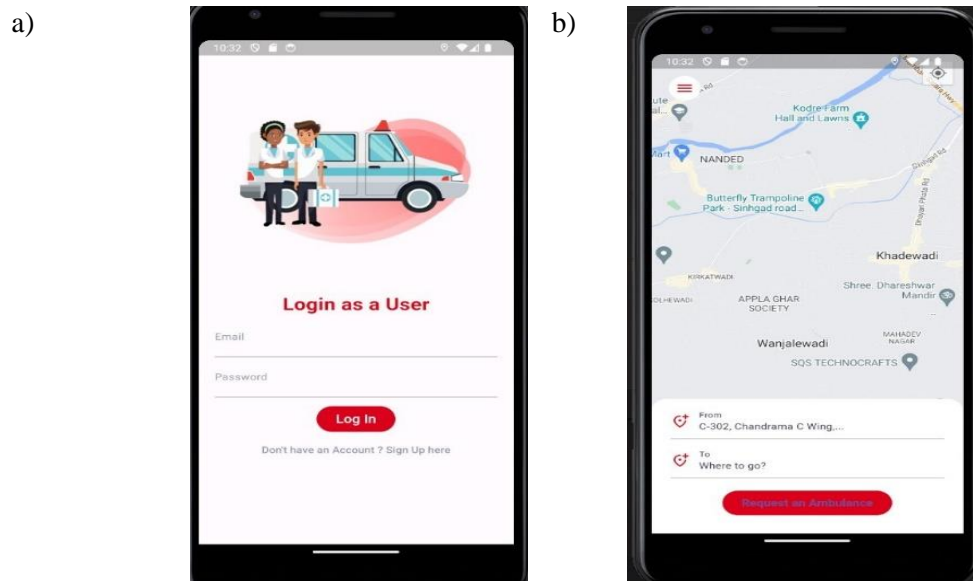


Figure 4. a) Login page of user application b) Map integration and location page of application

Moreover, Deerghayu caters to the needs of ambulance drivers, offering a dedicated interface for efficient communication and navigation. Equipped with real-time updates and intuitive features, drivers can manage incoming requests, navigate to pickup locations, and provide timely assistance to individuals in need. This symbiotic relationship fosters a cohesive ecosystem for emergency response, ensuring prompt and effective medical assistance. Through its user-centric design and seamless functionality, Deerghayu exemplifies a transformative approach to emergency medical services, ultimately contributing to improved public safety and well-being.

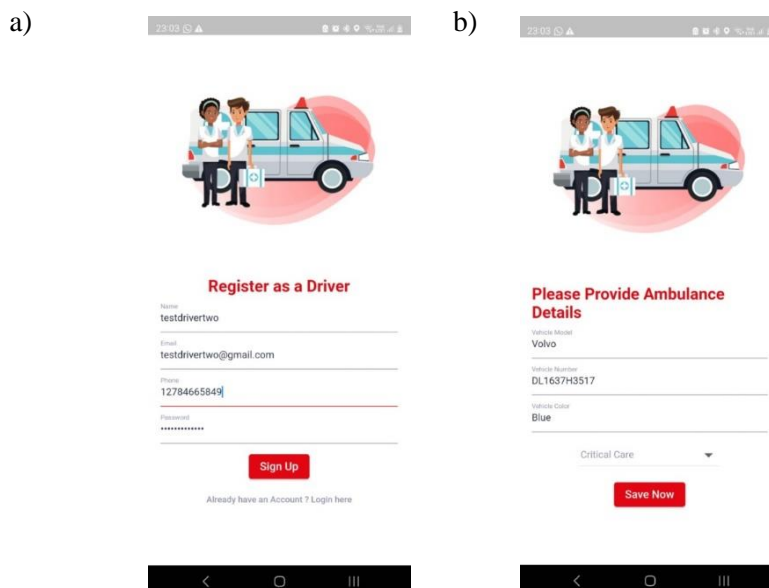


Figure 5. a) Registration Page of Deerghayu Driver App b) Ambulance details page of Driver app

## 5. Future Scope

Deerghayu's future lies in technological integration, including AI, ML, and IoT for predictive analytics and remote monitoring. Expanding into telemedicine and wearables will enhance its reach, while extending services to rural areas ensures equitable access. Through community engagement and educational initiatives, Deerghayu aims to promote emergency preparedness. Adopting interoperability standards will facilitate seamless data exchange with other healthcare systems, while continuous feedback loops will drive iterative improvements. Overall, Deerghayu is poised to revolutionize emergency medical services through innovation and outreach.

## 6. Conclusion

In conclusion, Deerghayu stands as a beacon of innovation and efficiency in the realm of emergency medical services. Our research has demonstrated tangible advancements in reducing response times and improving accessibility to critical healthcare resources. By prioritizing a user-centric design and implementing a streamlined booking process, Deerghayu has proven to be an indispensable tool for both users and ambulance drivers alike. The success of our project in enhancing emergency response mechanisms underscores its potential to redefine the healthcare landscape. Looking ahead, continued innovation and strategic expansion will further amplify Deerghayu's impact, ultimately contributing to heightened public safety and well-being.

## 7. References

- [1]Banswar A, Patel A. An Efficient Approach for ambulance tracking system using GPS and GSM. Journal of Physics: Conference Series.
- [2]Mell HK, Holland T. Emergency medical service response times in Rural, Suburban and rural areas.
- [3]Jayaraman S, Rickard R. Challenges and opportunities to improve efficiency and quality of prehospital emergency care using an mHealth platform: Qualitative study in Rwanda. African Journal of Emergency Medicine.
- [4]Miro J. Standards for Mobile Health-Related Apps: Systematic Review and Development of a Guide.
- [5]Elliott DK, Christopher H. Understanding GPS Principles and Applications. Norwood, MA: Artech House; 2006.
- [6]Kruse C, Betancourt J, Ortiz S, Valdes Luna SM, Bamrah IK, Segovia N. Barriers to the use of mobile health in improving health outcomes in developing countries: systematic review. Journal of Medical Internet Research.
- [7]World Health Organization. MHealth: New Horizons for Health through Mobile Technologic. Geneva: World Health Organization; 2011.
- [8]Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. Pharmacology and Therapeutics.
- [9]Saparamandu AADNS. User-centered Design Process of a mHealth App for Health Professionals: Case Study.
- [10]Schnall R, Rojas M, Bakken S, Brown W, Carballo-Dieguez A, Carry M, et al. A user-centered model for designing consumer mobile health (mHealth) applications (apps). Journal of Biomedical Informatics.

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