

## Research Article

**Received:** November 10, 2023

**Revised:** March 25, 2024

**Accepted:** April 23, 2024

DOI: 10.60101/past.2024.251696

## Emergency Reporting System via Smartphone the Case Study of the Rajamangala University of Technology Thanyaburi (RMUTT)

Weena Janratchakool<sup>\*</sup>, Burasakorn Yoosooka<sup>2</sup>, Suvil Chomchaiya<sup>3</sup>,  
Napasorn Sukjai<sup>1</sup>, and Thanida Thabured<sup>1</sup>

<sup>1</sup> Division of Computer Science, Faculty of Science and Technology,  
Rajamangala University of Technology Thanyaburi, Pathumthani 12110, Thailand

<sup>2</sup> Department of Computer Engineering, Faculty of Engineering, Rajamangala  
University of Technology Phra Nakhon, Bangkok 10800, Thailand

<sup>3</sup> Department of Mathematics, Faculty of Science, King Mongkut's University of  
Technology Thonburi, Bangkok 10140, Thailand

\*E-mail: weena\_j@rmutt.ac.th

### Abstract

The major objective of this research project is to develop a smartphone-based emergency reporting system, the case study of the Rajamangala University of Technology Thanyaburi (RMUTT). This was about to be the preliminary source for first aid instructions for major system users: students and paramedic staff (ambulance drivers and medical attendants). RMUTT's students, faculties, and staff can not only report in case of any accidents or emergencies but also follow the system-provided first aid instructions. Paramedic staff can be reported to and can reply to the reporters. The development tools for websites and mobile applications are the Visual Studio Code with MySQL and phpMyAdmin as database engine.

The overall 16 system functional features were tested for accuracy, and all were 100% accurate, which means that the system was comprehensively developed where all system objectives were satisfied. The expert evaluation result was a GOOD level ( $\bar{x} = 4.43$ ) where the 0.48 in standard deviation (S.D. = 0.48) means no significance. System evaluation by major users (paramedic personnel) is in GOOD level ( $\bar{x} = 4.24$ ) where the 0.71 in standard deviation (S.D. = 0.71) implied the significance.

**Keywords:** Emergency, Reporting System, Smartphone

### 1. Introduction

There are several types of on campus accidents such as vehicle related (motor vehicle and bicycle accidents), activity related (injuries from sports, recreations, and so on), health-related (hypertension, and other medical emergencies). Usually, if any security persons had passed by the accidental scene, they would be responsible in reporting the campus paramedic unit. However, on the vice versa, student(s) or accident victims may need to find

the emergency calling number. Unfortunately, there would be lengthy delays for paramedic personnel to arrive at the accidental scene if emergency calling number could not be found on-time or unfound due to the panic or frustration. Moreover, in case of preliminary first aid by by-passers, it would be the life threatening (or perhaps the death) if without proper fundamental knowledges and practices.

The recent available mobile applications, such as EMS1669, Poh Tech Tung

1418 (sponsored by the Poh Tech Tung Foundation) and JS100 (sponsored by the Jor-Sor: a 100 MHz channel traffic radio broadcasting station), have a functional feature that can call an ambulance from nearby hospitals or public rescue units. However, these three mobile applications are still lacking being source of preliminary first aid instructions. However, there are also time allowance and distance for off campus ambulances to arrive at the accidental scene, compared to that of the on campus.

With the situation stated above, there was an initiation to develop a smartphone-based emergency reporting system for RMUTT campus use. This application will enable the direct call to campus paramedic unit that also includes in-apps preliminary first aid instructions. At the emergency report time, accidental scene snapshot(s) must be accompanied with the report as proof. The locale and information of accidental emergencies will be accurately reported to the campus rescue units. This is to lessen the chance of on-campus loss and promote better on campus safety. Also, this app can encourage the volunteer mindset for RMUTT's students as well.

## **2. Related Theories and Research**

### **2.1 Emergency medical services**

Emergency medical services (1) is the preliminary care of the off hospital or scenic patients or injurers who need urgent medical attention prior to transferring to a proper healthcare professional or institute. This is to save a patient's life or lessen the life-threatening risk and trauma.

### **2.2 Preliminary First Aids**

Preliminary first aid (2) is immediate or on-the-scene medical assistance which requires skills and knowledge in corporate with appropriate decision making. Medical assistance in this situation may need only any artifact(s) available at the time or on the scene to support symptoms until reaching professional medical attentions or transferring to a hospital for the more particular cares. For example, cardiopulmonary resuscitation or CPR during waiting for an ambulance or rescue vehicle which can be performed by not only limited to medical personnel but also anyone with proper fundamental knowledge and skill.

### **2.3 Applications**

Mobile Applications (3) or apps are computer programs developed to facilitate the various usages that are intentionally to be used on any mobile devices. There are various apps developers to support each mobile operation system to anticipate the user's needs, in downloadable format with both free and paid subscriptions for various usages.

### **2.4 Database System**

Database (4) is the systematic storing of relational data to anticipate the needs of organizational usage. Data must be designed in relational structure for further use. Data in database could be numerical, pictorial, alphabetical, and textual.

### **2.5 Related research**

There are mobile applications development for emergency assistance services from groups of people, as cloud based to promote the sharing and caring society. Most research (5, 6) mentioned the better convenience, promptness, and simplicity in emergency reporting. Users can also be involved in the relieving of risk and severity of emergencies while promoting volunteering mind-set.

There are subscription registration and emergencies location-based report via Android operating system, with Global Positioning System (GPS), to locate the user's locale. The research results indicated the accuracy in locating the accident site which led to the on time emergency assistance that can lower the risks and losses.

Sarah et. al., (7) studied the Disaster Alert and Notification System via Android Mobile Phone, using Google Map to locate the shelter or safe zoning as pre-warning measure toward natural disasters via mobile short message service (SMS). This system would send the natural disaster signal current, detected from the GPS, in accompany with the suggested shortest distance of available shelters or safe zoning on the earth map. Such an application can navigate people who live in natural disaster-prone area(s) to the safer zones while also facilitating and monitoring the users' evacuation progress.

Spies et. al., (8) developed a smartphone base first aid application to enable the ability to perform emergency preliminary first aid for those who have never been practiced. Such application could enable unpracticed users to perform preliminary first aid where 90% of users had rated this application as a comprehensive first aid assistance application that was not necessarily required further improvement while the remaining 10% suggested that pictorial messages should be added to support illiterate users.

Mounika, et al., (9) developed an emergency tracking and localization using Android mobile phones to manage and control the transportation system with GPS locators. Such system was based on Radio Frequency Identification (RFID) technology for tracking the Global System for Mobile (GSM). The research results indicated the satisfied convenience and usability in that the assistance can be on the emergency site on-time manner without lengthy conversational explanations. Also, the emergency site location was reported as real time that can be accurately navigated to via the shortest and fastest route.

Sikder et, al., (10) developed the Smart Disaster Notification System for disaster pre-warning and navigating the best route to the closest safe zones or shelters. Moreover, such a system can forecast the weather condition based on the real time weather condition. System tools

are GPS, SMS, and voice warning call with Android operating system.

### 3. Research Methodology

#### 3.1 Research procedures

3.1.1 Explore and collect relevant data regarding incident reporting, first aid instructions, and interviewing with RMUTT's paramedic personnel (ambulance drivers).

3.1.2 Analyze system requirements based on the collected data. We proposed the framework according to Figure 1.

3.1.3 System analysis and design through the Context Diagram shown in Figure 2 and Data Flow Diagram shown in Figure 3.

3.1.4 Analyze and design database system with Entity-Relationship (ER) Diagram shown in Figure 4.

3.1.5 Application page design Based on searched research and from viewing sample application websites. along with seeking advice from an advisor using Adobe XD.

3.1.6 Database development with MySQL

3.1.7 Application development via Visual Studio Code

3.1.8 System test and revise where the testing would be in concurrent in each development life cycle.

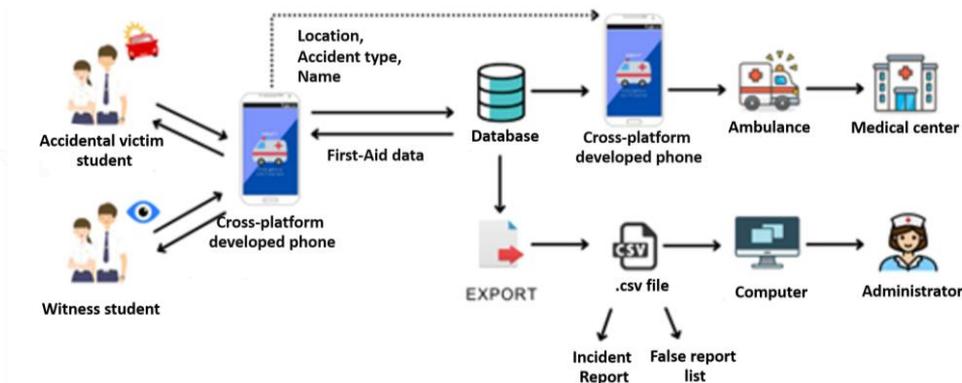


Figure 1 The Framework of the System

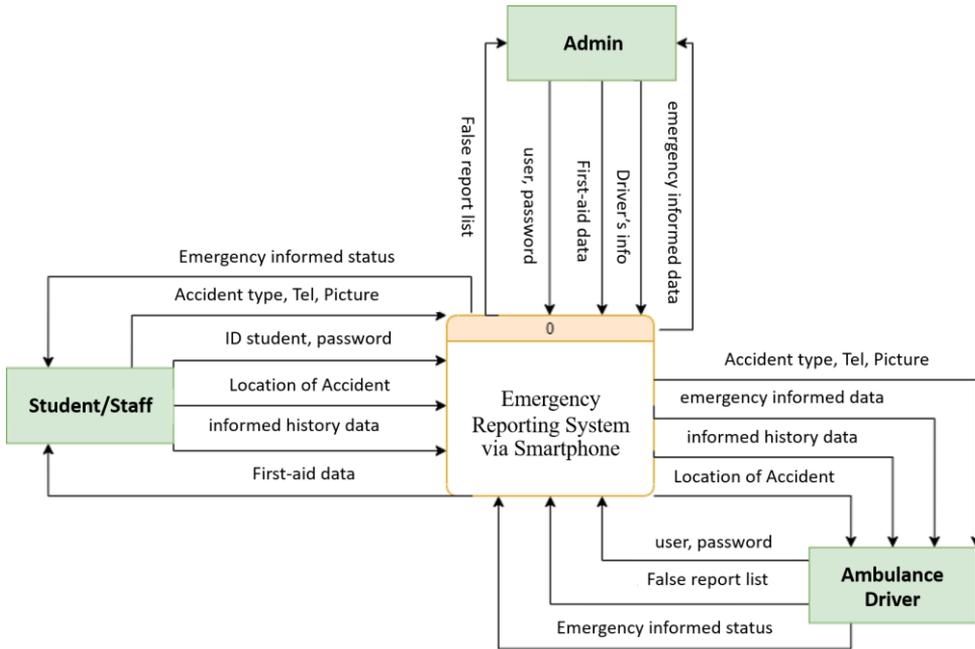


Figure 2 Context Diagram

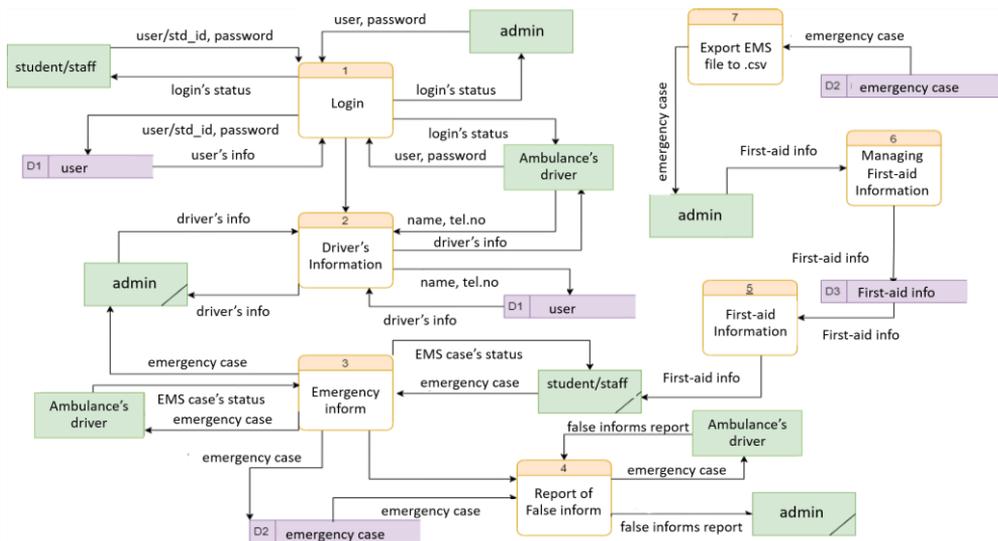
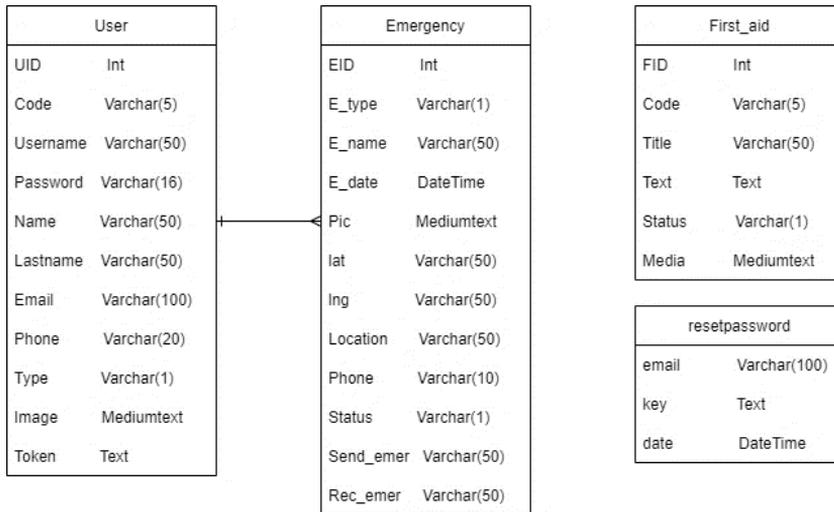


Figure 3 Data Flow Diagram: Level 1



**Figure 4** Entity-Relationship (ER) Diagram

### 3.2 Design and development tools

GPU NVIDIA GeForce GTX 1050  
 Ram 16 GB was the employed hardware element while the Windows 10 base software that includes Visual Studio Code (as development tools), MySQL (as database development tools), and XAMPP (as server simulator) were employed.

### 3.3 Evaluation

#### 3.3.1 The performance tests

The performance tests of the Emergency Reporting System via Smartphone have been conducted, which are divided into three parts as follows: 1) the part of the students and staffs, including 3 functions as follows: login, emergency case informing and notification function 2) the part of ambulance drivers, including 4 functions as follows: login, checking emergency case inform history, notification and personal profile editing function 3) the part of administrator, including 9 functions as follows: login, password recovery, emergency case inform history checking, .csv file export, management of first-aid information, management of ambulance driver information, overall emergency case overview in graphical form, personal profile editing and search function.

#### 3.3.2 The satisfaction assessment

The statistical tools (percentage, mean, and standard deviation) were used for user satisfaction evaluation .

## 4. Result and Discussion

This chapter reports the conclusions and recommendations that resulted from this study.

### 4.1 Result

4.1.1 RMUTT's students and staff could report emergency incidents, browse for fundamental first aid instructions, and emergency calling numbers as shown in Figure 5.

4.1.2 Ambulance drivers could retrieve incident reporting history and were being alarmed when the there was an incoming incident reporting and could confirm the incident reporting along with the detecting of the false reporting shown in Figure 6.

4.1.3 System administrator can retrieve historical data regarding emergency incident reporting either annually or monthly shown in Figure 7.

The overall report interface includes graphical visualization based on the classification and number of reported accidental incidents as shown in Figure 8. The annual statistics can also be retrieved.

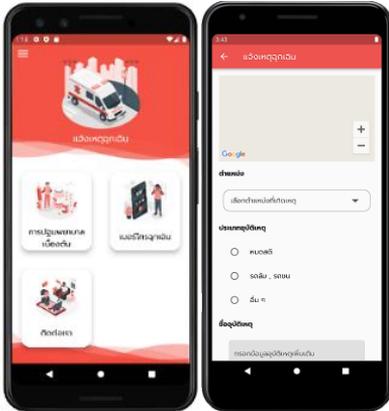


Figure 5 Interface for RMUTT’s students and staff

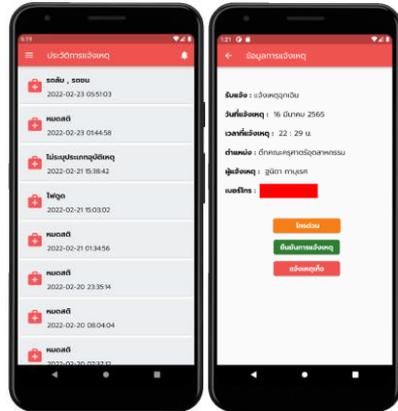


Figure 6 Interface for Ambulance Driver

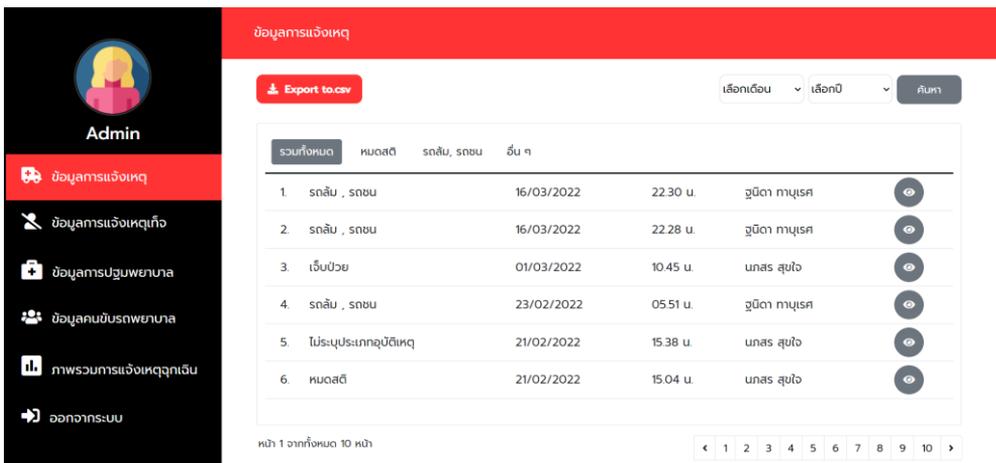


Figure 7 Interface for Incident Reporting



Figure 8 Interface of Overall Incident Report Statistics

## 4.2 Analysis Results

### 4.2.1 The system efficiency

The overall 16 system functional features were tested for accuracy, and all achieved 100% accurate.

### 4.2.2 The satisfaction evaluation

Pertaining to three expert reviews as shown in Table 1, the overall system efficiency was at a GOOD level ( $\bar{x} = 4.43$ ) with no significance (S.D. = 0.48).

**Table 1** Expert Reviews

No.	Evaluation Dimension	Score		
		Mean	Standard Deviation	Indication
1	System Design	4.40	0.66	GOOD
2	System Requirements	4.22	0.47	GOOD
3	Data Security	4.67	0.31	VERY GOOD
Total		4.43	0.48	GOOD

The user satisfaction analysis, as shown in Table 2 (System Administrator and Ambulance Driver), indicated the GOOD level of system efficiency ( $\bar{x} = 4.10$ ) with no significance (S.D.=0.30).

**Table 2** User Satisfaction Analysis (System Administrator and Ambulance Driver)

No.	Evaluation Dimension	Score		
		Mean	Standard Deviation	Indication
1	System Quality	4.00	0.40	GOOD
2	System Design	4.20	0.20	GOOD
Total		4.10	0.30	GOOD

The user satisfaction analysis is shown in Table 3. (System Administrator and Ambulance Driver) indicated the GOOD level of system efficiency ( $\bar{x} = 4.24$ ) with notable significance (S.D. = 0.71).

Pertaining to the best practice standard for rescuing, cycle time beginning from the timing when reporting an incident to the arrival of rescuing team on the incident site, should be within 10 minutes. The cycle time of the developed system was only 4.55 minutes, which is considered as appropriate time duration as shown in Table 4.

**Table 3** User Satisfaction Analysis (RMUTT's Students and Staffs)

No.	Evaluation Dimension	Score		
		Mean	Standard Deviation	Indication
1	System Quality	4.33	0.71	GOOD
2	System Design	4.15	0.71	GOOD
Total		4.10	4.24	0.71

**Table 4** System Cycle Time (Incident Reporting)

Dimension	Duration (Min.)
Time from beginning reposting an emergency incident until the presence of campus ambulance.	4.55

## 5. Conclusions and Recommendations

### 5.1 Conclusions

The major objective of this research project is to facilitate the better convenience when requesting a campus ambulance in case of accident. All evaluation and expert review results indicated the GOOD level which implied the full system efficiency in conform to all objectives with 100% system comprehensiveness.

### 5.2 Recommendations

5.2.1 To enhance the better usability, system should be furtherly developed to be able to analyze and issue warning suggestion about the accident-prone location(s), based on the historical data.

5.2.2 The Google Map module employed in this project should be further elevated to be a Live Location Tracking (the interface for RMUTT's students and ambulance driver).

### Acknowledgements

It is the deep appreciation to the research project sponsorship via the annual revenue budget of Faculty of Science and Technology, Rajamangala University of Technology Thanyaburi (RMUTT) and Faculty of Engineering, Rajamangala University of Technology Phra Nakorn (RMUTP), 2023 fiscal year. The RMUTT and RMUTP executive supports are also deeply appreciated pertaining to the accomplishment of this research project.

### Declaration of Conflicting Interests

The authors declared that they have no conflicts of interest in the research, authorship, and this article's publication.

### References

1. Bangkok Emergency Medical Service. Emergency Medicine and Emergency Medical System [Internet]. 2017 [cited 2021 Feb 24]. Available from: <http://ems.bangkok.go.th/>
2. S. Sirasak, S. Jariya et al. First Aid Manual (Pocket Version) [Internet]. 2014 [cited 2021 Feb 24]. Available from: <https://www.dnp.go.th/>
3. Admission Premium. What is Mobile Application ? [Internet]. 2017 [cited 2021 Feb 24]. Available from: <https://kpoppreorder.com/>
4. Silberschatz A, Korth HF, Sudarshan S. Database system concepts. 6th ed. U.S.: McGraw-Hill; 2011.
5. L. Theerapong et al. The Development of Mobile Application for Requesting Emergency Assistance from Crowds. JIST. 2017;7(2):20-31.
6. S. Sinpob. Development of EMS registration and EMS location service based on Android application. Naresuan University. 2016
7. Sarah S, Dilip M, RahulAravindh R. Disaster alert and notification system via android mobile phone by using Google map. Int Res J Eng Technol. 2016:2709-13.
8. Spies C-M, Khalaf A, Hamam Y. Development of a first aid smartphone app for use by untrained healthcare workers. Afr. j. inf. commun. 2017;20:31-47.
9. Mounika M, Selvi C, Rajamani K, Malathi J. Emergency tracking and localisation using android mobile phones. Int. J. Pure Appl. Math. 2018;119(12):13483-91.
10. Sikder MF, Halder S, Hasan T, Uddin MJ, Baowaly MK, editors. Smart disaster notification system. 2017 4th International Conference on Advances in Electrical Engineering (ICAEE); 2017 28-30 Sept. 2017.