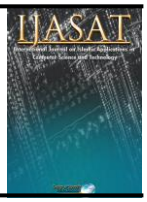

Paramedic on Demand: First Aid App for Pilgrims

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Abstract
Paramedic on demand application is an Android application for mobile devices, that would improve the quality and efficiency of the Health Ministry services that would be provided to the citizenry and foreigners by Saudi Red Crescent. The application used google maps functionalities to determine patients location on the emergency cases, it is also includes direct call to Saudi Red Crescent, user medical profile and first aid procedures. In critical situations; which every second counts, paramedic on demand try to make a real difference in solving many problems that my faced people and red crescent authorities by forwarding the request of rescue in millisecond, ultimately ensuring that user receives the instant help that he/she needs. in addition, it helped user to know what to do in few crucial moments. It is developed using Rapid Application Development (RAD) which is an effective methodology to provide much quicker development and higher-quality results than other software development methodologies This project conducted to develop the quality and efficiency of the health care services, further studies took place to produce a version of the application that would serve the pilgrims and focus on their needs in Al-Hajj with English and Arabic languages. Moreover, the Health Ministry and The Ministry of Hajj and Umrah might adopt this application and others applications that promote awareness among public, automate the ministries services, delivering high-quality services for the benefit of pilgrims, and try to achieve the national vision2030 of Saudi Arabia.

Keywords: Mobile Health Care; RAD; Saudi Red Crescent Services; Hajj; Vision2030.

1. Introduction

Smart devices and wearable technologies are becoming increasingly popular throughout society. It's no surprise that the number of individuals using these devices to monitor and manage their health. These devices also used by the government to promote the new model of health delivery – mobile health or mHealth which supported by national vision 2030.
mHealth is defined as the "medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistances and other wireless

devices" (New Horizons for Health through Mobile Technologies: Based on the Findings of the Second Global Survey on eHealth, 2011).

mHealth has many advantages, "including its versatility across all areas of healthcare and its potential to improve the health monitoring of at-risk patients. It could allow for earlier interventions and significantly decrease admissions to hospital, along with visits to GPs and healthcare practitioners generally". (Moyle, 2018)

Paramedic on demand application is one of mHealth applications that assist health professionals in the provision of care. The application would improve the quality and efficiency of the Saudi Red Crescent services. It would combine features of emergency call applications and first aid applications. Also, it will allow the user to make an immediately emergency request for Saudi Red Crescent Authority and send his location and his personal and medical information to them, The application also would solve many problems that faced the injured when calling the ambulance, such as locating the accident site and thus it saves time and life of injured. It also makes it easier for paramedics to know the most important health issues of the injured before applying first aids and help them to contact his relatives.

2. Literature review

This section is the overview of the local famous app that constructed to achieve the same of objective.

Two types of emergency applications were studied well and their weakness as well as the .strength points also were highlightedTable1 illustrated the features and the user experiences for using these applications.

Table 1: Performance feature of some of the emergency application

Application name platforms &	Application's description	Performance	user experience
Red Panic Button Android & iOS 	The Red Panic Button allows users to quickly send out an emergency message to your trusted contacts to say that you're in distress. Users define their emergency contacts, and with a press of the red panic button within the app or) through widgets), the app sends out an SMS and email message with your address and location	Pros • The app will immediately send an SMS and an E-MAIL containing your GPS coordinates in a Google Maps link to your contacts • support wearable devices Cons • Does Not include a first aid instructions • Does not include contact with emergency agency • Absence of a the medical and personal information	Pros • universal app not restricted on specific region • the app easy to learn and use • Simple interfaces design • The app uses clear icons with buttons • comfortable colours combinations • support 5 languages Cons • Main page need more organizing • The app has a lot

		• Many features are available only on paid version • continuous use of GPS running in background can dramatically decrease battery life • Panic SMS doesn't work on some devices Wi-Fi	of advertisements that distract the .user attention
American Red Cross First Aid app Android 	American Red Cross' First Aid app appears to be very well designed, the information is accurate and friendly so that patients can benefit from it. The use of videos to better explain emergency is a great addition as are all sorts of checklists to prepare for natural disasters and other situations	Pros • Preloaded content that gives instant access to all safety information at any time Cons • The app has a lot of educational details that doesn't help in emergency situations • Doesn't support emergency call and the user medical information	Pros • Friendly user interface • Solid information • Provides many .videos Cons • Doesn't support another language since the app assumes one is on the United States of America
First aid from the Palestinian Red Crescent **Android & iOS** 	The official IFRC First Aid app gives you instant access to the information you need to know to handle the most common first aid emergencies. With videos, interactive quizzes and simple .step-by- step advice	Pros • Preloaded content that gives instant access to all safety information at any time Cons • The program doesn't support a locator feature and information about the patient	Pros • Friendly user interface • illustrative pictures and video • allow the user to add non urgent emergencies number • the app easy to learn and use • Support 2 languages Cons • special categories do not support deaf and dumb

Go to AID First Aid Lite Windows,IOS .and Android	Go to AID brings immediate access to first aid information for people,cat and Dog It also provides a full disaster preparedness section on what to do before, during and after a disaster. Created for the non-professional responder. Go to AID easy-to- follow instructions and illustrations for everything from bee stings to weather related emergencies to a complete Sudden Cardiac Arrest incident. Go to AID is also an outstanding resource for those who want to enhance their emergency care training	Pros • The app size is 26m so, Supports most .version • Provides windows phone,ios and .android device • Provide Quick Call .for emergency case • Determining the user's current location Cons • High costs (18.87R.S) • Does not support Arabic language	Pros • Provides emergency number for each countryntains the steps of the first aid and supports .printing directly • Provides medical .consultations • Support preparedness for environmental disasters based on weather for country such as earthquake and flood Cons • Difficult to use the app depends on the user's choice of location so it does not support the interactive map (GPS)
Help me Android & IOS	To complement the efforts of the Saudi Red Crescent Society, this application has been provided to assist .people in emergencies The application provides the following services: Opening an emergency communication with the Saudi Red Crescent Authority and increasing the accuracy of the location. Send urgent distress in case of extreme emergency	Pros • Opening an emergency communication with the Saudi Red Crescent Authority • Supporting deaf and dumb people with special needs • Record the details of your medical history • Informs you of the medical facilities near you • Issuing lights and warning sounds to alert those around the patient	Pros • User friendly interface • Fast response • Support three language English, Arabic,) (Urdu • Zero cost Cons • The app doesn't have educational details

	for both the Red Crescent and people close to you through .the short SMS service	• Provide Quick Call for emergency case Cons • The program is not specialized in emergency situations, but can provide the user several communications to many government agencies which wastes the time	
First aid Android 	A person may face emergency situations without warning, and when he know how to act in such situations, it may save human life. This application help user to be aware of the importance of right behavior in emergency situations and be more confident in his ability to help .others	• Medical Information and details to increase the awareness of the citizens • Access the application without internet • A simple set of steps to save the life of the injured	• The program does not support multiple languages • The program does not contain sound • Has many illustrative pictures

3. Problem statement of the project

Many problems that may face paramedics and individuals in emergency situations. Some of the problems that may encounter individuals such as they may not knowing the emergency number (children or elders), may the time limited, difficult to determine the location. In Al-Hajj the authorities deal with large crowds of different nationalities in small geographical area

The problems that paramedics run into when receiving emergency calls:

- Loss time and thus loss life of the injured in some cases, because inaccurate location description
- Complications caused by moving the patient from accidents place or by wrong first aid procedure
- Paramedics in many cases not aware of the patient's medical history and his blood type
- Sometimes there is no way to communicate with relatives of the patients.

Paramedic on demand application is a technical solution to the problems that faced the injured when calling the ambulance, such as locating the accident site and thus it saves time and life of

injured and problems that faced the paramedics like knowing the most important medical information of the injured before applying first aids.

4. Project objective

The application amid to improve the quality and efficiency of Saudi Red Crescent to achieve this goal other objectives are placed:

- To collect the functions requirements for the improvement.
- To design the target approach.
- To develop robust application.

5. Methodology

To achieve the objectives of the proposed project the RAD (Rapid application development) method is considered to give much faster development and higher quality systems than the traditional life cycles. RAD model distributes the analysis, design, build and test phases into a series of short, iterative development cycles. ("SDLC RAD Model", 2018) Following are the various phases of the RAD Model:

First stage1: Information gathering

This step in the RAD model takes information gathered through many related sources including literary studies of emergency and first aid applications, questionnaires, interviews and first aid books The analysis takes all the pertinent information from these resources. This info is then combined into a useful description of how the information can be used, when it is processed, and what is making this specific information successful for (Paramedic on demand) application. (Rouse, .2016).

Second Stage 2: Data Modelling

During the Data Modelling stage, all the information gathered during the previous phase is analysed. Through the analysis, the information is grouped together into different groups: project scope, constraints, hardware and software requirements, user requirements, and functional and nonfunctional requirements of the application. The quality of every group of information is carefully examined and given an accurate description. A relationship between these groups and their usefulness is also established during this phase of the RAD model.

Third Stage 3: Process Modelling

The Process Modelling phase is the step in the RAD model procedure where all the groups of information gathered during the Data Modelling step are converted into the required usable information (using case diagram and sequence diagram). During the Process Modelling stage changes and optimizations can be done and the sets of data can be further defined. Any descriptions for adding, removing, or changing the data objects are also created during this phase.

Fourth Stage 4: Application Generation

The Application Generation step is when all the information gathered is coded. The data models created are turned into actual prototypes (real application) that can be tested in the next step.

Fifth Stage 5: Testing and Turnover

Every model is tested individually so that components can quickly be identified and switched in order to create the most effective product. By this point in the RAD model, most of the components have already been examined, so major problems with the application are not likely. Figure 1: illustrated meanwhile ,Rapid application development model Figure 2 illustrated the frame work of the project (Hassan.et al, 2015).

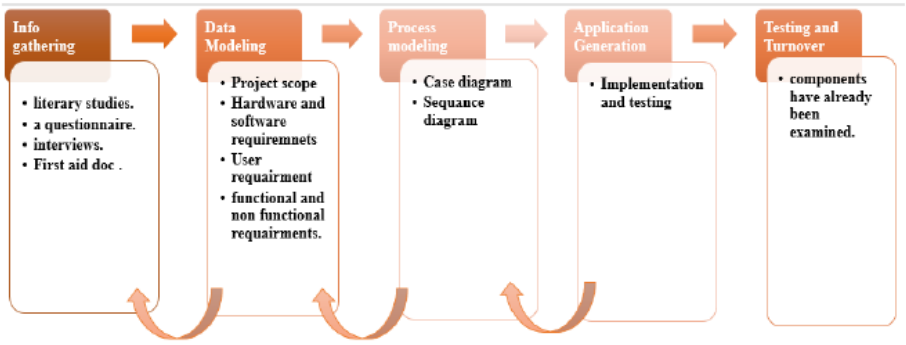


Figure 1: Rapid application development model

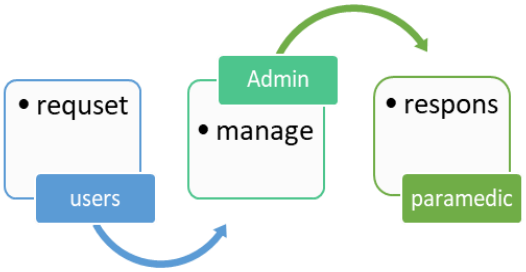


Figure 2: The framework of POD

Figure 3 shows the extended frame of POD.

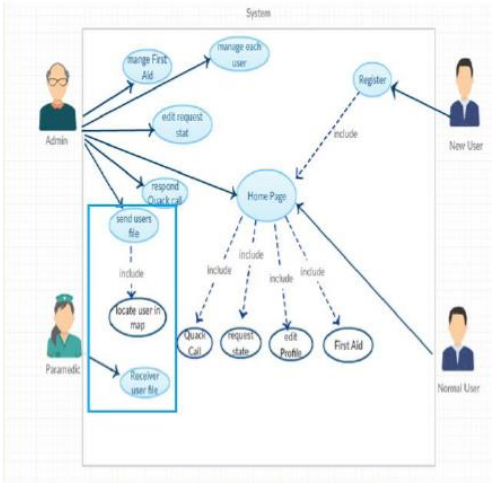


Figure 3: Extended framework of POD

6. Development Environment

Paramedic on demand application is a customized software product that serves the Saudi Red Crescent Authority paramedics. The hardware and software platforms that Paramedic on demand runs on is any Android operating system devices that compatible with API 23 or higher such as Nexus 5, Nexus 6, Nexus 9...etc.

This application developed using Android software development kit that targeting API 23 (Marshmallow version) and later, so it has more features available and will run on more devices that active on the Google Play Store.

7. System Implementation and Testing

The Paramedic on demand application useda backend as a service (BaaS) provider which is Firebase, the fully managed platform for building Android apps that provides automatic data synchronization, authentication services, messaging, file storage analytics, and more ("Mobile App Backend services| solutions| Google cloud ",2018).

The plan that used to develop this application is based on the situational Leadership theory, which is one of the most important theories in management. This theory has suggested that the behavior of the leader interacts with the level of the team member's maturity and significantly influences the effectiveness of the leadership in focusing either the task or on the relationship with the member. The following figure shows the theorythat used in the plan:

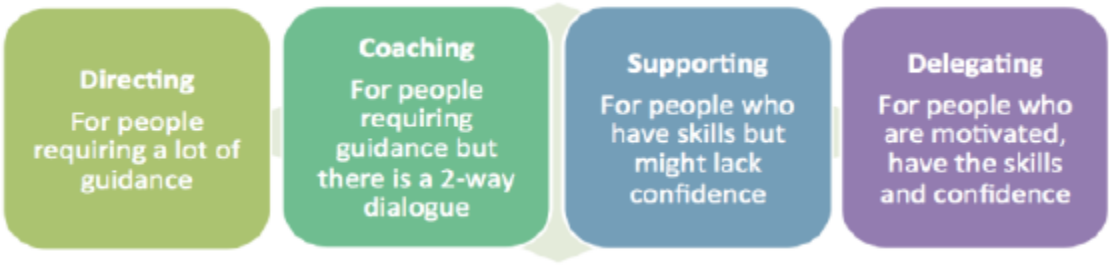
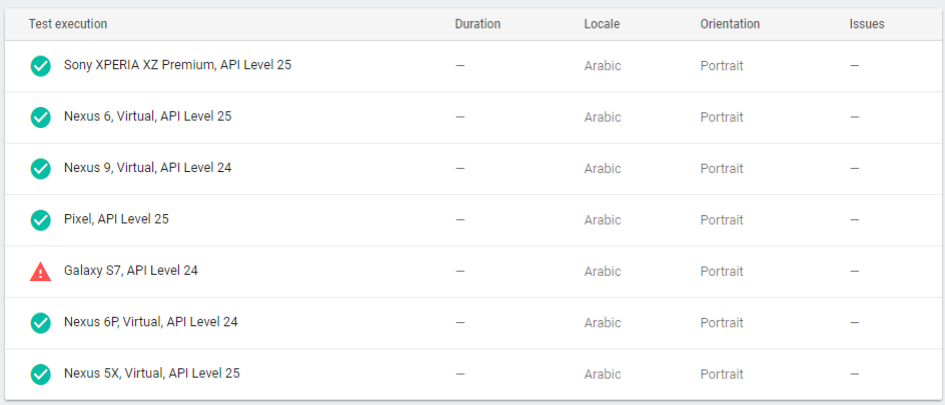


Figure 4: Theory the situational Leadership
Taken from https://carloselopez.com.

- **Testing**

Paramedic on demand application tested by using Robo test which is a test tool that is integrated with Firebase Test Lab for Android. Robo test analyzes the structure of app's UI and then explores it methodically, automatically simulating user activities. The application tested across a wide variety of devices and device configurations. Test results including logs, videos, and screenshots are made for that as shown in the following figure 7.



Test execution	Duration	Locale	Orientation	Issues
Sony XPERIA XZ Premium, API Level 25	–	Arabic	Portrait	–
Nexus 6, Virtual, API Level 25	–	Arabic	Portrait	–
Nexus 9, Virtual, API Level 24	–	Arabic	Portrait	–
Pixel, API Level 25	–	Arabic	Portrait	–
Galaxy S7, API Level 24	–	Arabic	Portrait	–
Nexus 6P, Virtual, API Level 24	–	Arabic	Portrait	–
Nexus 5X, Virtual, API Level 25	–	Arabic	Portrait	–

Figure 7: Test phase

User experience of application also tested,the table below shows UX properties of Paramedic on Demand application.

Table2: User experience properties

Properties	1	2	3	4	5	Other comments
interaction design				√		
content strategy					√	
user interface					√	
Usability					√	
Functionality					√	
visual design					√	
information architecture				√		
Language				√		

8. System Prototype

Following figures The (8 to 12) represents the Paramedic on demand prototype interfaces:

Figure 8:branded launch screen

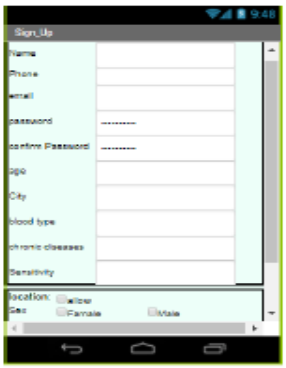


Figure 9:sign-up screen

Figure 10: login screen

Figure 11:Home screen

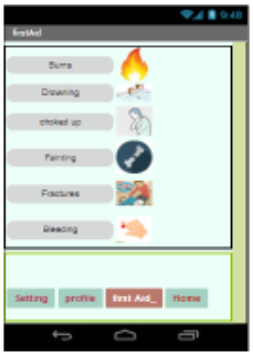


Figure 12:Firs Aid screen

9. Conclusion and Future Work

Paramedic on demand is android application that will be available to all users to help them in emergency situation and allows the Red Crescent Center to identify the injured locations and send their medical file to the paramedics. The project is a serious attempt to make a significant difference in the improvement of Ministry of Health and its services and promote the national vision 2030 that is trying hard to develop e-government services. Finally, the application promotes health awareness and the good use of technology among community members. In future The researchers intend to improve the app to facilitate the Quick emergency request through Video Call and enhanced with different languages such as Bahasa, Urdu and others.

References

Android Tech. (2018). Androidtech.ga. Retrieved 2 May 2018, from http://androidtech.ga/marshmallow.html8- Mobile App Backend Services | Solutions | Google

Android. (2018). Android. [online] Available at: https://www.android.com/ [Accessed 20 Feb. 2018].

Cloud. (2018). Google Cloud. Retrieved 2 May 2018, from https://cloud.google.com/solutions/mobile/mobile-app-backend-services9- Chatalalsingh, C. and Reeves, S. (2014). Leading team learning: what makes interprofessional teams learn to work well?. Journal of Interprofessional Care, 28(6), pp.513-518.

GeeksforGeeks. (n.d.). Divide and Conquer - GeeksforGeeks. [online] Available at: https://www.geeksforgeeks.org/divide-and-conquer [Accessed 23 Apr. 2018].

Hassan, S., Qamar, U., & Idris, M. A. (2015). Purification of requirement engineering model for rapid application development. 2015 6th IEEE International Conference on Software Engineering and Service Science (ICSESS), 357–362. https://doi.org/10.1109/ICSESS.2015.7339074

Interaction design Foundation. (2018). What is Interaction Design?. [online] Available at: https://www.interaction-design.org/literature/article/what-is-interaction-design [Accessed 28 Apr. 2018].

Rouse, M. (2016, August). Rapid Application Development (RAD). Retrieved from http://searchsoftwarequality.techtarget.com

Stackoverflow. (n.d.). Learn, Share, Build. [online] Available at: https://stackoverflow.com/ [Accessed 28 Apr. 2018].

Uxmag. (2013). Functional Beauty and User Experience. [online] Available at: https://uxmag.com/articles/functional-beauty-and-user-experience [Accessed 20 Mar. 2018].

(. بحث - نماذج النظرية الموقفية الموسوعة2015 الجزائرية للدراسات السياسية والاستراتيجية.). [online] Available at: https://www.politics-dz.com/threads/nmadhg-alnzri-almuqfi.731/ [Accessed 23 Apr. 2018].