การพัฒนาแอปพลิเคชันการปฐมพยาบาลบนโทรศัพท์มือถือ สำหรับอาสาสมัครสาธารณสุขประจำหมู่บ้านในประเทศไทย

The Development of First Aid Mobile Application for Health Care Volunteers in Thailand

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บทคัดย่อ

การวิจัยครั้งนี้มีวัตถุประสงค์เพื่อออกแบบและพัฒนาแอปพลิเคชันให้ข้อมูลบนโทรศัพท์มือถือ ซึ่งจะช่วยให้อาสาสมัครสาธารณสุขประจำหมู่บ้านในประเทศไทยมีทักษะและความรู้ที่จำเป็นในการให้ความช่วยเหลือการปฐมพยาบาลการจัดการฟื้นคืนชีพของผู้บาดเจ็บ ผู้ประสบเหตุ และผู้เจ็บป่วยฉุกเฉิน ที่จำเป็นต้องได้รับการช่วยเหลืออย่างทันท่วงที เพื่อนำส่งสถานพยาบาลที่ได้มาตรฐานอย่างรวดเร็วและทันต่อเหตุการณ์ ผลจากการวิจัยได้รับความช่วยเหลืออย่างมากจากผู้ที่ตระหนักและให้ความสนใจในการให้ข้อมูลรวมถึงบุคคลที่มีความสามารถในการให้ความช่วยเหลือจากกรณีฉุกเฉินที่เกิดขึ้น การประเมินประสิทธิภาพและประสิทธิผลของเทคนิค ผู้วิจัยได้นำระบบต้นแบบสำหรับอุปกรณ์

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สมาร์ทโฟนไปติดตั้งเพื่อใช้งานและทำการทดสอบสมมติฐานการวิจัยในการศึกษาครั้งนี้
ประกอบด้วย 2 กลุ่มทดลอง ได้แก่ ผู้เชี่ยวชาญที่เป็นเจ้าหน้าที่สาธารณสุขจำนวน 6 คน
และอาสาสมัครสาธารณสุขประจำหมู่บ้าน จำนวน 206 คน ผลการทดสอบแสดงได้ ดังนี้
1) ประสิทธิภาพของระบบได้รับการประเมินโดยผู้เชี่ยวชาญด้านสาธารณสุข (Mean = 3.69,
S.D. = 0.44) ซึ่งอยู่ในเกณฑ์ดี แสดงให้เห็นว่าแอปพลิเคชันบนโทรศัพท์มือถือสามารถใช้
งานได้อย่างมีประสิทธิภาพผ่านทางอุปกรณ์สมาร์ทโฟนและ 2) ความพึงพอใจของผู้ใช้งาน
มีความพึงพอใจอยู่ในระดับดี (Mean = 3.94, S.D. = 0.47) ซึ่งแสดงให้เห็นว่าการพัฒนา
ระบบในภาพรวมมีความเหมาะสมอยู่ในระดับดี ผลการวิจัยแสดงให้เห็นว่าการรับรู้
คุณลักษณะต่างๆ เช่น ขั้นตอนการออกแบบและพัฒนาระบบ รวมถึงคุณภาพของข้อมูล
จะส่งผลให้เกิดความมุ่งมั่นและตั้งใจที่สูงขึ้นอันจะนำไปสู่การใช้งานแอปพลิเคชันการให้ข้อมูล
ข่าวสารเกี่ยวกับการปฐมพยาบาลบนโทรศัพท์มือถืออย่างต่อเนื่อง นอกจากนี้ความมุ่งมั่น
ของผู้ใช้งานมีอิทธิพลต่อความสนใจในการใช้งานแอปพลิเคชันบนโทรศัพท์มือถือต่อไปใน
อนาคต

คำสำคัญ: การปฐมพยาบาล, แอปพลิเคชันบนโทรศัพท์มือถือ, โฟนแกป, เจคิวรี่,
อาสาสมัครสาธารณสุขประจำหมู่บ้าน

Abstract

This research aimed at designing and developing first aid mobile application
on smart phones for village health care volunteers in Thailand to improve their
necessary skills and knowledge for their rescue operations for injured and
emergency patients who needed quick delivery to standard hospitals. The study
was greatly assisted by those who were interested in providing information and
individuals who could provide help to emergency cases. In evaluation the
efficiency and effectiveness of the application, the researcher installed the prototype
application and tested the research hypothesis. This study divided the participants
into 2 groups: the experiment group consisting of 5 experts selected from public
health officials and 206 village health volunteers. The evaluation results revealed
that 1) the efficiency of the application system on smart phones assessed by the

public health experts was at a good level (Mean = 3.69, S.D. = 0.44). This indicated that the application on smart phones was effectively utilized, and 2) the application users' satisfaction was found to be at the top level (Mean = 3.94, S.D. = 0.47). This also indicated that the application development was found to be generally at the high level. The findings of this study suggested that the knowledge on the design and development of the application as well as the quality of the information would lead to the determination in the continual use of the first aid mobile application on smart phones. In addition, the application users would impact future utilization

Keywords: First-Aid, Mobile Application, Phonegap, jQuery, Health Care Volunteer

Introduction

In Thailand, the health care volunteers in villages have performed their work based on prescribed roles and duties at a high level. When considering each aspect, it was shown that, in working, health care volunteers have performed the role in giving treatments at a high level, followed by taking the roles of controlling and preventing diseases, health-care promotion, and rehabilitation, respectively. There were differences in roles and duties performed by health care volunteers with different educational level, status, and income.In fact, roles and responsibilities executed by health care services volunteers in the village with different gender, age, occupations, length of working, and areas of responsibility (Tuengrat, 2013). They have practice problem in their personality role such as not enough knowledge in first aid, lack of leadership, skills in news distribution, communication techniques, and self-confidence (Boonyaviboon & Rojsomrith, 2016). However, the village health volunteers were capable of directing exercise for health activities and effectively performing exercise for health activities by means of jogging, running, bicycling, aerobics, and physical exercises. Moreover, the handbook on advising the exercise for health activities was found to be suitable and practical for the village health

volunteers (Deebukkum, 2005).Buaosonte et al. (2012) emphasized the vital role of village health volunteers is changing according to the political situation and health status. Maintain first aid records and resources are covers the skills and knowledge required to maintain first aid resources and related records. First aid knowledge is in valuable for both you as the individual and for your society. It empowers you to help persons who become injured in the event of emergency or an accident situation until help arrives. First aid skills can be utilized in the workplace,the home, or in public locations, therefore the more first aid certified people there are in a society the safer that society becomes (First Aid Accident & Emergency, 2018). Therefore, it is necessary to adapt the concept and the implementation to the changing situation.The performance of health volunteers requires knowledge, skills, good characteristics, and novel tools to perform.

In spite of modern technological advances, help incident response and relief efforts suffer from a lack of co-ordination and data access. The ministry of public health faces problems related to data collection and information management for health care services officer that can lead to a waste of knowledge. Several times relief health care volunteers end up resorting to slow manual work, because a potentially more efficient automatic instruments are difficult to use or simply does not work. The ubiquity of smart phone devices has become invaluable in first-aid management and relief procedures. Data collection and management through mobile devices accelerates the aggregation and usability of the data, with the ability to connect to many other data sources as well.

Presently, there are several mobile applications running in smart devices, with ability to promote better monitoring of health, which might facilitate better carefulness. Mobile devices were supported all applications on mobile for health as medical and health practice, such as smartdevices, monitoring patient devices, tablet devices and other wireless devices were defined by WHO (WHO, 2011). Numerous researches show that most people use more and show more interest

in new technologies, particularly technologies related to health care. According to the Food and Drug Administration (FDA), the mobile applications for health should: help people, monitoring of health conditions without providing treatment recommendations; the health information is provided control and organize by simple tools; information related with health were provide easy to access; support to document the health conditions, the health providers were made easier to share information; automate simple tasks for health care providers; be intended to transfer, store and display medical data(U.S. Food & Drug Administration, 2015)

Most researchers conclude that the maximum beneficial applications for the aging in the future are related with applications that are able to preserve their social connections, health and happiness (Mikkonen, Väyrynen, Ikonen & Heikkilä, 2002). Nevertheless, mobile informative applications for health care volunteers should go through a process of assessment in order to guarantee the quality and truthfulness of its content as well as its usability The usability of applications is a quality feature related to the ease of use, more specifically, refers to the degree of user-friendliness, competence, mistakes and the amount of end users and specialiststhat like to use the mobile apps(Nielsen & Loranger, 2006). At current, there are many difficulties more especially when it comes to health mostly when provisioning preliminary care for an injured being. Lots of people are helpless to give first aid to a target most especially if they donot have background of knowledge in it. An action for treatment to an injured person up to seeking medical attention is first-aid. It should give livelihood to the casualty and generally consist of a series of a simple and in some cases, possibly live saving practices that an individual can be trained to perform with limited of equipment. Therefore, the importance of empowering the village health volunteers as they acted closely with the people in the community so that they can look after individuals, promote health, and establish themselves as role models and consultants for primary health care (Sararak, 2010).

This study purpose to design and develop a mobile application that will provide health care volunteer in Thailand a skill and knowledge required to deliver first aid response, life sustenance management of injured person, the incident and other first aiders until emergency qualified support arrives at the scene of the occurrence.

Research Objective

The research objective is to develop a mobile application for support perform ofhealth care volunteers in Thailand on how are the proper procedures and techniques in giving basically medical assistance to somebody injured within their response area. This will help users to extending their knowledge and to training them in a potentially life saving techniques which can be accomplish with restricted equipment. It prompts the responsiveness of the users and improvements their spiritual awareness by giving the correct of information. By the use of this mobile application, users can learn by themselves which is mainly focus on first aid management.

Research Conceptual Framework

The conceptual framework shows the Input-Process-Output (IPO) model to explain the platforms of the project development. Agile methodologies address the process of face-to-face communication, as it is not a heavy documentation centric approach. Only face to face communication is not probable in distributed agile process (Holz & Maurer, 2002). This will serve as guide in order to show up the study. We use Hybrid Development (jQuery Mobile and Apache Cordova) to advance this firstaid mobile informative application. Specify in this concept framework are the methods on how the application will be develop. The concepts will provide as an instruction on how the development process will be.
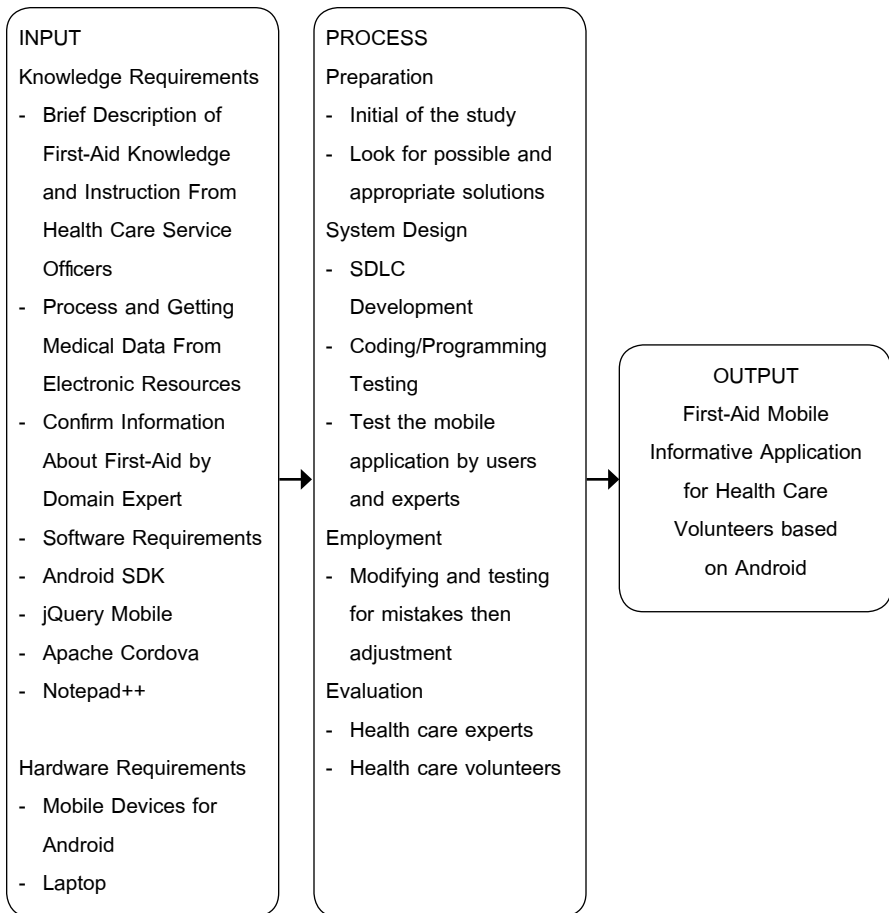
INPUT	PROCESS	
Knowledge Requirements	Preparation	
- Brief Description of First-Aid Knowledge and Instruction From Health Care Service Officers	- Initial of the study - Look for possible and appropriate solutions System Design - SDLC Development - Coding/Programming Testing - Test the mobile application by users and experts	
- Process and Getting Medical Data From Electronic Resources		OUTPUT First-Aid Mobile Informative Application for Health Care Volunteers based on Android
- Confirm Information About First-Aid by Domain Expert		
- Software Requirements		
- Android SDK		
- jQuery Mobile	Employment	
- Apache Cordova	- Modifying and testing for mistakes then adjustment	
- Notepad++	Evaluation	
Hardware Requirements	- Health care experts	
- Mobile Devices for Android	- Health care volunteers	
- Laptop		

Fig. 1 Research conceptual framework

Development Tools

The limitation of this project is only work on android operating system. In stage,we utilize the following technologies to develop a mobile application:

1. Android - A mobile operating system (OS) based on the Linux kernel and at present developed by Google is Android. With a user interface based on

direct management, for touchscreen mobile devices such as smartphones and tablet computers was designed by Android, which with particular user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate on screen objects, and a virtual keyboard. Even though being primarily designed for touchscreen input, it also has been used in game consoles, digital cameras, and other electronics. The most popular mobile OS is Android. Originally developed by Android, Inc., which Google backed financially and later bought in 2005, Android was revealed in 2007 along with the founding of the Open Handset Alliance a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for moveable devices. Android is popular with technology companies which require a ready-made, low-cost and customizable operating system for high-tech devices. Androids open nature has stimulated a great community of developers and supporters to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices which were officially, released running other operating systems. The operating systems success has made it a target for patent hearing as part of the so called smartphone wars between technology companies.

2.   Phonegap – A mobile development framework was created by Nitobi. The Nitobi was taken by Adobe Systems in 2011. It enables software programmers to build applications for mobile devices using JavaScript, HTML5, and CSS3, instead of relying on platform-specific APIs like those in iOS, Windows Phone, or Android. It enables wrapping up of HTML, CSS and JavaScript code depending upon the platform of the device (Adobe, 2011). Apache Cordova (Fermoso, 2009) it enables wrapping up of CSS, HTML, and JavaScript code depending upon the platform of the device. It extends the features of HTML and JavaScript to work with the device. The resulting applications are hybrid, meaning that they are neither truly native

mobile application nor purely Web-based (because they are not just Web apps, but are packaged as apps for distribution and have access to native device APIs). Mixing native and hybrid code snippets has been possible since version 1.9.

       3.   jQuery Mobile -A touch-optimized web framework (also known as a mobile framework), more specifically a JavaScript library, currently being developed by the jQuery project team is jQuery Mobile. The development focuses on creating a framework compatible with a wide variety of smartphones and tablet computers (The jQuery Foundation, 2017) made necessary by the growing but heterogeneous tablet and smartphone market.(Higginbotham, 2010) The jQuery Mobile framework is compatible with other mobile app frameworks (Grabanski, 2013) and platforms such as PhoneGap, Worklight (IBM, 2017) and more.

Methodology

       This research is a mixed method research consists of a two-stage methodology. The first stage is the qualitative research approach. The study aims at understanding the foremost management main concern in the context of preliminary health care sector mobile application for volunteer projects' software development. Qualitative research is often characterized by the use of multiple methods, which is often referred to as triangulation. Literature shows that different methods can be used in qualitative research such as participant observation, analysis of texts and documents, interviews, recording and transcribing The proposed of mobile application development aims to be user centric.Organizations that are well known as customer-centric would have a tendency to focus on satisfying customers in their objectives (Rashid, Abdeljawad, Ngalim& Hassan, 2013).Appreciative of SDLC stage is requirement in the current study context. SDLC or software development lifecycle is broadly segregated over 6 vital phases: plan, analyze, design, build, test-execution and deployment. Out of these the first five stages are essentially the stages where the concept of software development, not

only becomes a priority but becomes necessity. Fig. 2 illustrates use case diagrams for administrator and end users of the first-aid mobile application. We conducted the sequence following:

A diversity of data sources is applied during our survey, in which in-depth interviews, literatures review, and observations are included. In in-depth interview process with 5 health care officers were selected by snowball sampling, we ask questions to them related to their responsibility operation and practitioners who work in village area selected by purposive sampling. We perform our survey for research point of view in the production to activate the data to navigate the interview process. During our research work, we complete our work in both stages, in the first stage we obtain the relevant features of android mobile application, and we conduct a questionnaire in the interview process. In the second stage, we conduct another questionnaire on the basis of information of health care services in community, and we organize the emerging features of the application for smart device.
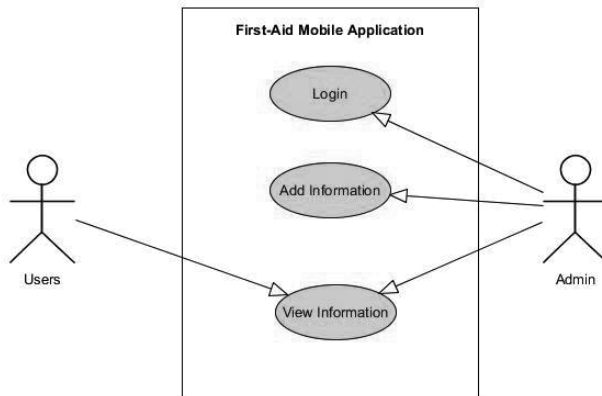

Fig.2 Use case diagram of administrator and end users

We also got feedback from current end users both 5 health care officers and 25 volunteers, and communicate with skillful people of relevant context to get supportive ideas. Interviews are conducted with end users of both experts and volunteers. In our survey, we got feedback from total 30 persons, in whom 5 persons were health care officers of the preliminary hospital, and 25 persons were health care services volunteers in villages of Thailand. The diagrammatic view of the mobile application in Fig.3 is shown the result of educated in the first stage. Proving first aid information consistency, correctness, availability, up to date, and certainty by the director of preliminary hospital, who accountability everything in hospital and scope of services area.
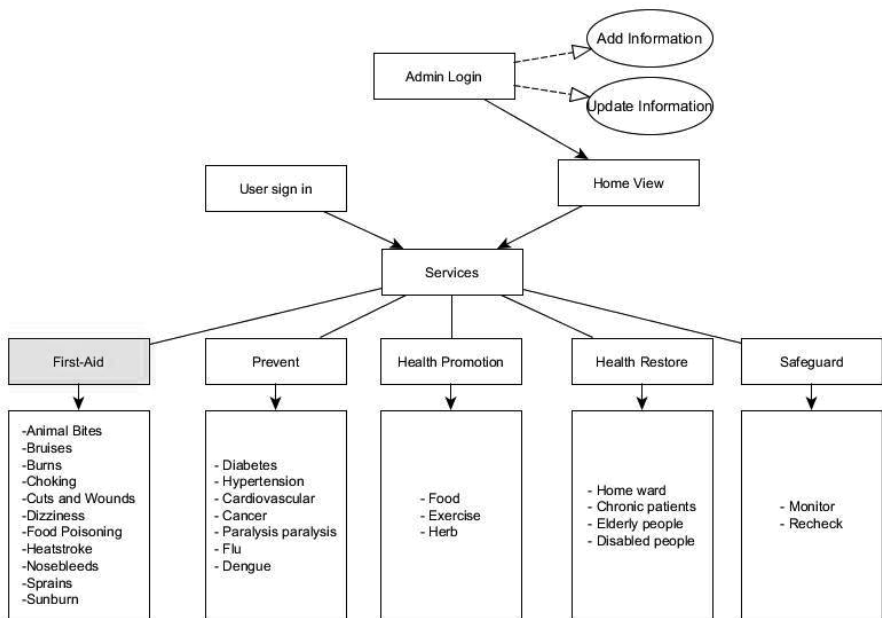

Fig. 3 Diagrammatic view of Mobile Application

The Proposed Mobile Application Reliability Measurement Framework

This stage objective is to develop a reliable mobile application rather than limited to evaluate the reliability of the completed creation. We propose in this section a new process in which reliability techniques and metrics are integrated from requirement to evaluation phase in such as SDLC. The use of reliability models and techniques from the requirement phase will improve reliability by developing required specification and avoiding unneeded evaluate. Hence, appropriate corrections and improvements will be done with reduced cost and time. Furthermore, in evaluation phase, the parallel use of application metrics, reliability models and techniques enhance the measurement of reliability and minimize the cost and effort needed for corrections and improvements. Finally, rather focusing only on describing fundamentals of reliability measurement i.e. models, techniques and metrics, we have to identify their use in each phase of the SDLC. These will assistance developers to make sure the reliability level of their systems in each phase of SDLC. However, the validation of this process we using data from real projects are required (Lyu, 1996) is shown in Fig. 4.
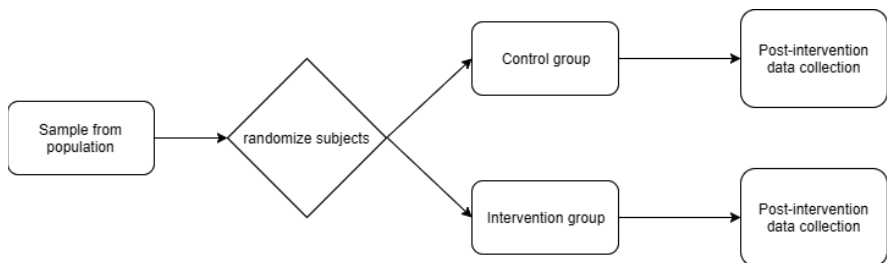

Fig. 4 Posttest design

We stated that reliability measurement covers techniques, models and metrics. We also observed that the existing reliability measurement process focused only on the use of reliability models in the measurement step in the evaluation

phase. However, reliability measurement as described above includes models, tools, techniques and metrics which can be applied earlier in the SDLCis shown in Fig. 5.

The one-group posttest only is design in training operation. A posttest only design is simple and straightforward. This type of design can be done with one group of participants. Participants receive an intervention and are tested afterwards. We want to know whether its volunteers benefited from practioners' training in first aid mobile application. Following the implementation of the training, volunteers were given a short survey (posttest) to evaluate their satisfaction with the application. The surveys were used to provide feedback and make changes to adjust a mobile application development.
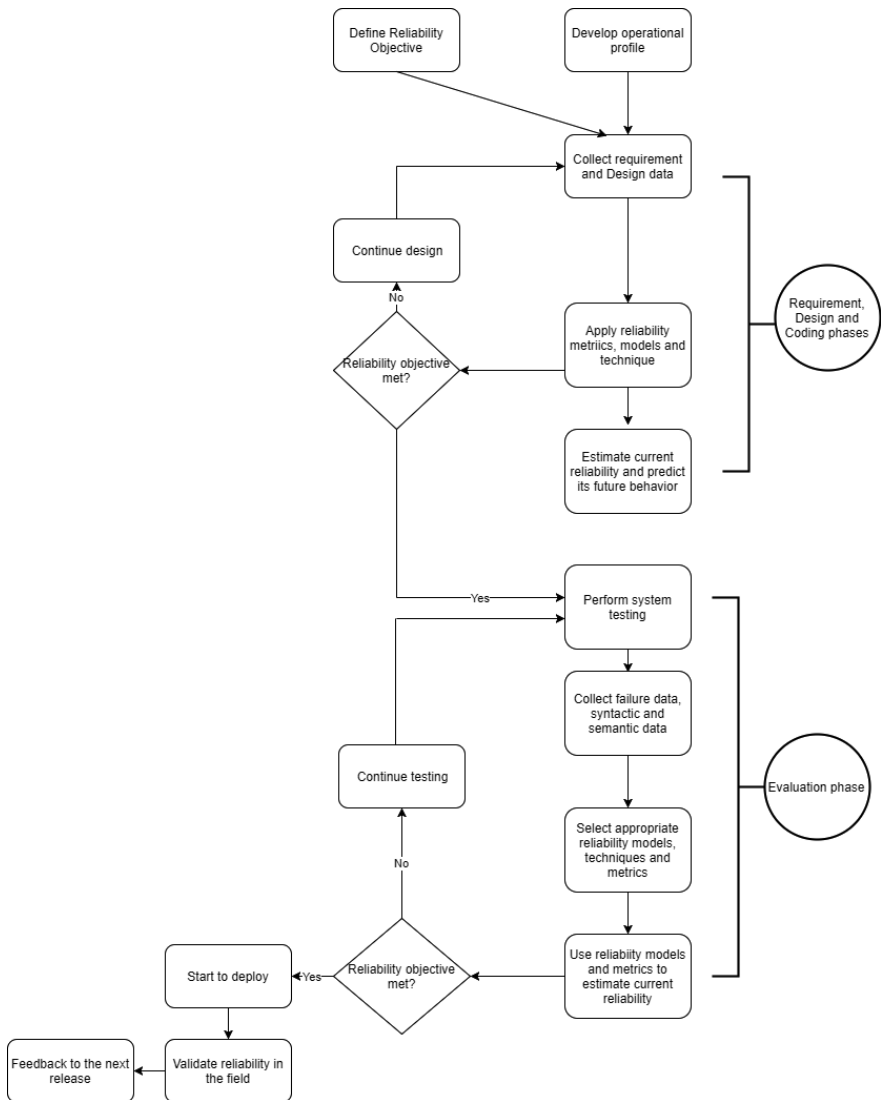
Fig. 5 The proposed mobile applicationreliability measurement process

Results

Mobile Application Development

After installation, user can open and can start the test upon selecting the subject. Each issue will be given submenu for the related details. User has to click for browse the option within the scope and after submission, correct information will be shown. Also user can view the information previous and clip video demonstration of all the users. Real end users are the health care volunteers, by using they can surf. Administrator assignment is to add more information up to date and to keep track of previous as well as current results of information frequency to access.

Exactly, when a user starts the mobile app they can sign in as a health care volunteer. If the user login as an administrator, user can view the results of all the other users or can insert the information into the database by selecting a particular area and then by selecting the subject related to that area. Administration task is to add more information up to date and to keep track of previous as well as current results of information frequency to access. If the health care volunteer has login as simple user, then home view of the mobile app will be visible. They can open and can start the test upon selecting the subject. Each issue will be given submenu for the related details. User has to click for browse the option within the scope and after submission, correct information will be shown. Also user can view the information previous and clip video demonstration of all the users. Actual Users are the health care volunteers, by using they can surf. In the home view, there are five icons for different domains and purposes. By clicking the First-Aid icon, they will found the information about solution for patient. User can read the tutorial for learning and practice by themselves.

As we know that smart device has major role by developing innovative technologies, which support the users in number of different contexts. For evaluation of corresponding technologies usability testing is conducted, and it is

associated with the developing application properties, features and user interface. In usability testing of mobile application, the unique features such as information outline, performance and screen size, different display resolutions and restricted processing capability and design.
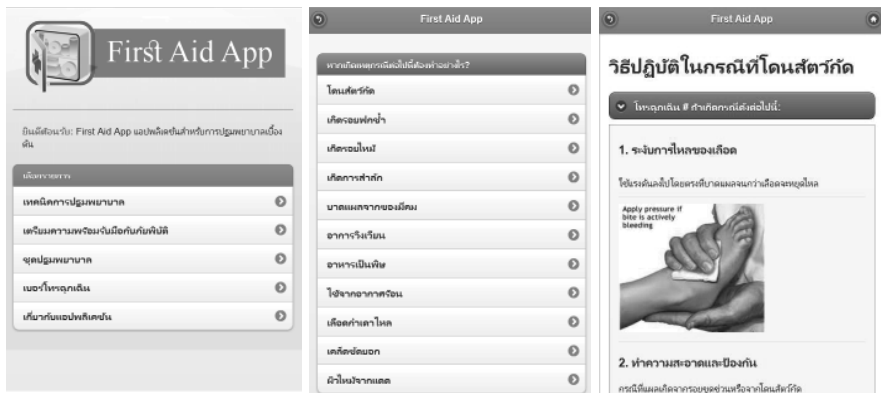

Fig. 6 Snapshots of the mobile informative application for health care volunteer

Mobile Application Evaluation Results

The main objective of this project was to test the performance and satisfaction of experts and users in health care services fields, they can reviewer, where they are using. It provides help in health care practitioner included in the Frist-aid mobile application. It provides information to users so that they can learn along with giving on the mobile screen.

Evaluation of our research study is carried out on the basis of usability testing of this application. We suggested users to download and install our mobile application. We gave questionnaire to 206 health care volunteers were selected by simple random sampling and after this we make observations for their behavior to use a first aid mobile application. The feedback and score obtained from these persons is given in Table 1,2. The tables show the detail results of the descriptive analysis of each of the variables.

Table 1 Performance evaluation result

Performance	Degree of Performance		
	Mean	**S.D.**	**Level**
1.Function Requirement Test	3.67	0.49	Good
2.Function Test	3.25	0.45	Good
3.Usability Test	3.83	0.83	Good
4.Security Test	4.00	0.60	Good
Total	3.69	0.44	Good

The performance result of the system was evaluated by a panel of sixpublic health experts (mean=3.69, S.D.=0.44), which was a good level. The mobile application can be effectively activated via smart mobile devices.

Table 2 Satisfaction assessment result

Satisfaction	Degree of Satisfaction		
	Mean	**S.D.**	**Level**
1.Usability	4.25	0.62	Good
2.Accuracy	3.58	0.79	Good
3.Design	3.92	0.79	Good
4.Security	4.00	0.60	Good
Total	3.94	0.47	Good

The satisfaction of end users be satisfied to a good level (mean=3.94, S.D.=0.47), which was a good level.

Overall, of all the four variables, satisfaction of mobile application has reported as having the goodlevel. This is shown in the mean value of 3.94 and S.D is 0.47. This is followed with performance of system, which has a mean value of 3.69 and S.D. is 0.44.

Conclusion

The smart devices have changed the life of everyone. Along with other features, a mobile app in smart device allows to do almost everything such as playing games and doing business. The development of first-aid mobile application for health care volunteers (FAA) described in this paper has given a strong thoughtful of numerous challenges associated with analysis, design, and development of application on smart devices. The experience has been quite challenging, motivating as well as satisfying.The FAA was developed as an application for first aid for health care volunteers in Thailand. It can also be used to prevent injuries. Because technology has become an indivisible part of human life, healthcare providers must incorporate it into services that they equip.The FAA can be used by users conveniently while preparing for practice in their responsibility area in village and community. More information may be added and updated from time to time so that the FAA can manage up with requirements of users by user centric method.

Recommendations

The approach to recommend methodology to the FAA development we sustain from our experiences and the data found having in consideration literature review, project base, and survey. The recommendation for FAA are: 1) Starting to capitalize in constructing the processes which are people oriented, to encourage collaboration and cultivation culture by having also additional attribute from two group between the 5 health care officers and 25 volunteers in rural area, relation and competence. 2) Regarding the SDLC, Agile in this matter it is a methodology which their successes depends on good team work. 3) Agileis not only a process or methodology, but also agile has to do with mindset and continuously that we need to develop and practice.

Suggestions and implications

The research presented in this paper aims at answering several questions in relation to the agile methodology with different knowledge and skill in rural area. However, following the findings described in this paper initiative could be commenced, we plan to add more contents and functions from relate knowledge domain and expand the contents until it covers first-aidfor help given to a sick or injured person until full medical treatment is available. More applications based on the ontology development will be implemented such as recommendation system and question-answering smart system.

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