

The Development of E-Tracking Application

Kunyanuth Kularbphettong, Sittisak Klinpub, Rujijan Vichivanives



Abstract: This paper describes the development of e-Document Tracking System based on Mobile Application to help patients and officers to keep track of the processes in order to resolve problems of working with in a day. This application was designed to support and enhance document tracking system. In addition to reducing paper usage, the application provides a map and give a direction in the hospital by applying QR Code scanning technology on the android operating system for data gathering. The users could see the hospital map which has shown a directory and description in each floor as the simulation. QR Code technology would run on a camera phone and QR Code Reader program for photo shooting, then it would process this QR Code as the original data for scanning by phone or the other device. To evaluate the system performance, questionnaires for system usability and Black Box Testing were used to measure expert and user satisfaction. The findings revealed that the users were more interested in QR Code application for helping patients in the hospital and the satisfaction on the system was in the highest level ($X = 4.66$, $SD = 0.11$).

Index Terms: About four key words or phrases in alphabetical order, separated by commas.

I. INTRODUCTION

Environmental crisis is one of the major problems in the world and reducing paper usage will be able to reduce both air pollution and the water used in the production. The use of paper directly affects deforestation and a global warming problem. With the rapidly growth of information technology, a social condition has changed too much due to the economic, social, political and cultural change, and then affected to the bringing of various strategies included new technologies for the management to develop the service quality for the satisfaction and impression of users. Health service is a basic right for all people to receive it in the good standard, and hospital is a significant place as the health service for illness and accident which the government has tried to manage it efficiently and inclusively in all areas but there is an

inequality in reality. In consequence, hospital is a public health service which has to develop the service quality to consistent with the need of patients in the accepted level of satisfaction.

Hospital, a significant place for the patients which there are 2 types consist of public and private hospital. A treatment system depends on the type of patients; General Patient: a patient with unurgent or chronic illness or a patient who is transferred from another hospital for the specific doctor and able to wait without any crucial condition, New Patient: a patient who has never treated at the hospital or ever been for more over 5 years which has to register the new record, and the Old Patient: a patient who has ever treated at the hospital or ever been for 5 years which doesn't has to register the new record.

There are different treatments for each type of the patients in gathering their record in the hospital database which they would be informed when have treated at the hospital for the next time, it is the primary process in gathering the patients' record in some case of the patients who want to know their own record and directory in the hospital themselves avoiding queueing up or asking the public relation officer. The advances in information technology have heavily influenced businesses in several ways. Information technology has helped to develop from the previous manual system to the automatically electronic system to track the work of the company to facilitate operations. A document management system is a computer system used to track, manage and store documents and reduce paper. Most are capable of keeping a record of the various versions created and modified by different users [1].

One of the software developments for more interesting and utilization is Quick Response Code (QR Code), a code with the quick response for data gathering; alphabet, numeric and binary, then encode and decode by the camera phone and QR Code Reader to the original data such as website's name, telephone number and message etc. to display it on the screen directly for who doesn't understand about QR Code technology. The software developer has applied Quick Response Code (QR Code) for many aspects such as; Agriculture: to inform the product details for who interested in, Education: for educating in various fields, Financial and Banking: for utilizing the transactions, Business: to advertise products or service of the enterprise, and the Tourism: to inform the destinations for tourists.

Due to the issues mentioned above, the researcher has focused on the application development to enhance a need of service and a help for patients by developing Quick Response Code (QR Code) technology for data gathering which it would affect to the efficiency of hospital service system for more interesting, the users could be informed a news, notification, schedule.

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II. RESEARCH METHODOLOGIES

To develop this project, data was surveyed and collected from user’s requirements so that the electronic document management system is similar to the old system and users can learn and understand the new system easily. RAD (Rapid application development) was used to design and implement this project [2]. RAD is one of the significant software development methodologies used to predefine prototyping techniques and tools to produce software applications. According to James Martin approach, RAD divides the process into four distinct phases: Requirements planning phase; User design phase; Construction phase and Cutover phase. In requirements planning phase, information was collected as a source of information for planning and analysis system and the related documents were divided into two parts: 1) internal documents and 2) external documents. The prototype system focused on user’s requirements and it was designed processes to be document filing process, document file search process, document delivery process by email and user management process.

Quick Response Code (QR Code) or 2 dimensions barcode, a code for data gathering such as the product price, contact number and website’s name which developed from barcode by Denso-Wave Company Limited, a chain of Toyota Group, Japan in 1994 and registered as "QR Code" in Japan and all around. It has focused on a quick reading through the camera phone and other device.

Database Management is a management of data source which gathered at the center to respond to a use of the applied program efficiently and to decrease a data redundancy included a data conflict in the organization.

III. SOFTWARE DEVELOPMENT

This research was a program development to apply for Mobile Application device to enhance a convenience for the patients and customers included enhance a technology proficiency of the hospital and the software development was as following: Requirement analysis and Design the purposed System.

A. Requirement Analysis

Hospital is a significant place for the patients to treat their symptom by following its process of Queueing Up to treat them orderly and Appointment to inform them details which is issued when they have arrived. Consequently, it has affected to a slowness and loss of the appointment, moreover an unclearness of the directory for new patients.

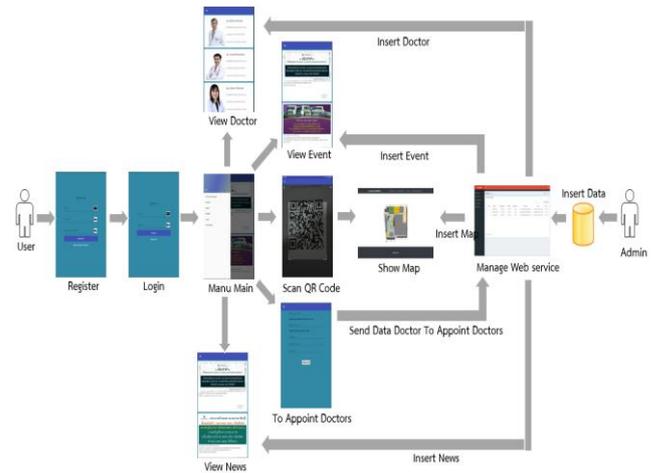


Fig. 1. System Overview

B. Design the purposed System

In requirements planning phase, information was collected as a source of information for planning and analysis system and the related documents were divided into two parts: 1) internal documents and 2) external documents. The study can be divided the processes of operations into 4 sections: data storage, data processing, resource management and data monitoring. Each section encounters a problem like data storage problem, data fragmentation, data loss, and invalid data.

For a better service system of the hospital by QR Code scanning technology on the android operating system to consistent with a need of users and the highest utilization for them, the researcher has studied on QR Code scanning technology on the android operating system to apply for the application development to help patients in the hospital.

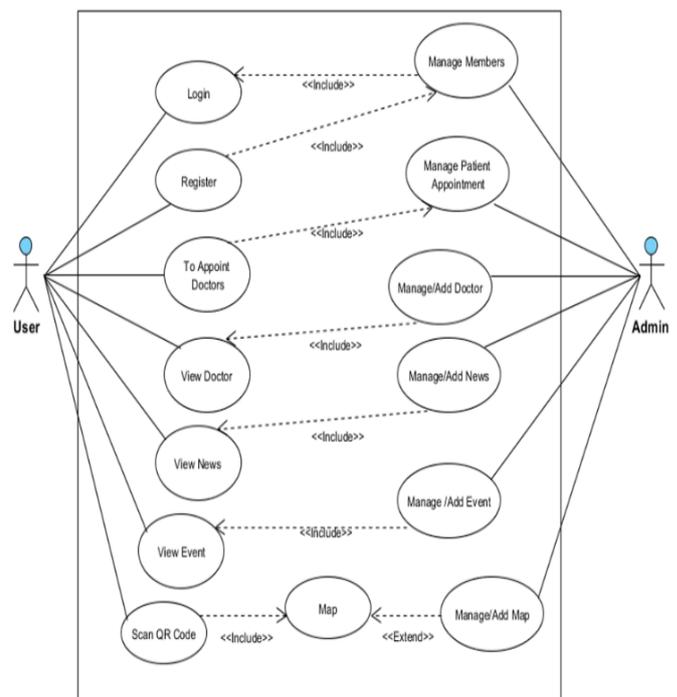


Fig. 2. Use case diagram.

In consequence, from the research of QR Code Application on Android Operating System for Helping Patients in the Hospital revealed that it was suitable for all aspects of enhancing the technology for hospital and Figure 1 was shown the system overview of this system. Also, figure 2 presented the Use Case Diagram acted to define the scope of the system and figure 3 was described the data base of the system.

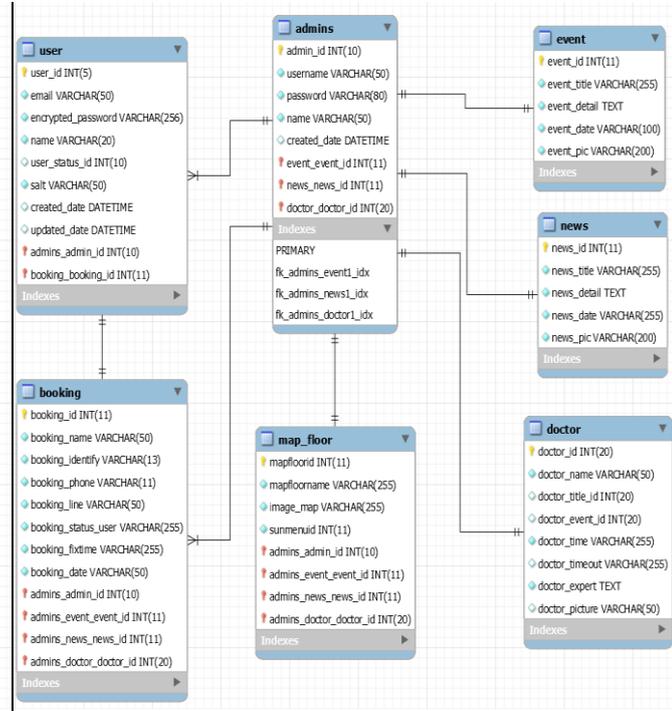


Fig. 3. Database of the System.

IV. EXPERIMENTAL RESULTS

In this section, experimental results were separated to 2 parts: developing the e-Tracking System and evaluating the performance and satisfaction of the application.

A. Developing the e-Tracking System

When a user touched the application, he or she would see the log-in page. In case of a non-member, he had to register it first. Then logged-in the first page of a photo system in the application which had a menu bar as following;

- 1) Schedule of Doctor – a detail of schedule, photo and specialization of the doctor.
- 2) Appointment of Doctor – a form of the appointment details for being a data checking of the users.
- 3) Notification – a notice or any changes from the hospital.
- 4) QR Code – a user could scan it from everywhere in the hospital for getting more information from the hospital.
- 5) Hospital Map – a user could see everywhere in the hospital for searching the checking room or expected area.
- 6) Exit – a menu for quitting out of the system.

The system administrator would log-in to check an awaiting data of the latest appointment and confirmation of users which they could also check and delete it. To develop the Thai Sign Language application based on android system, Figure 3 through 4 were shown the results of application.

B. The performance and satisfaction of the application

When tested and evaluated the user’s satisfaction and the

qualities of the system, Black box Testing and Questionnaires by specialists and users were used to test this project [3]. Black Box testing was determined the error of the project as following: functional requirement test, Function test, Usability test, Performance test and Security test [4]. The assessment of the efficiency and satisfaction were in 5 aspects as following;

- 1) Functional Requirement Test – an assessment of the system efficiency on how does it consistent with a need of users.
- 2) Functional Test – an assessment of the system function on how does it works.
- 3) Usability Test – an assessment of the system utility on how does it easy to use.
- 4) Security Test – an assessment of the system security on how does it have.
- 5) Integrity Test – an assessment of the system integrity on how does it have.

An excellent style manual and source of information for science writers is [5].

TABLE I: ASSESSMENT OF THE FUNCTIONAL REQUIREMENT TEST

Assessment of the Functional Requirement Test	Level of Proficiency (n = 11)					SD	Result	
	5	4	3	2	1			
1. Appropriateness of the information.	4 (20)	7 (28)	0 (0)	0 (0)	0 (0)	4.36	0.50	Highest level
2. Appropriateness of the information displayed on the screen of any device.	6 (30)	4 (16)	1 (3)	0 (0)	0 (0)	4.45	0.68	Highest level
Average value						4.40	0.18	Highest level

The table I shows the results of the assessment of the functional requirement test and the appropriateness of the information was 4.36 in average and 0.50 in SD. The appropriateness of the information displayed on the screen of any device was 4.45 in average and 0.68 in SD.

TABLE II: ASSESSMENT OF THE FUNCTIONAL TEST

Assessment of the Functional Test	Level of Proficiency (n = 11)					SD	Result	
	5	4	3	2	1			
1. Integrity of the information.	9 (45)	2 (8)	0 (0)	0 (0)	0 (0)	4.81	0.46	Highest level
2. Availability of the system	8 (40)	3 (12)	0 (0)	0 (0)	0 (0)	4.72	0.40	Highest level
Average value						4.76	0.06	Highest level

The table II shows the results of the assessment of the functional test and the Integrity of the information was 4.81 in average and 0.46 in SD. The availability of the system was 4.72 in average and 0.40 in SD.

TABLE III: ASSESSMENT OF THE USABILITY TEST

Assessment of the Functional Requirement Test	Level of Proficiency (n = 11)						SD	Result
	5	4	3	2	1	\bar{X}		
1. Accessibility of the system.	9 (45)	2 (8)	0 (0)	0 (0)	0 (0)	4.81	0.40	Highest level
2. Appropriateness of the composition.	5 (25)	5 (20)	1 (3)	0 (0)	0 (0)	4.36	0.67	Highest level
3. Appropriateness of the composition of each spot.	7 (35)	4 (16)	0 (0)	0 (0)	0 (0)	4.63	0.50	Highest level
4. Appropriateness of the composition of photos.	8 (40)	2 (8)	1 (3)	0 (0)	0 (0)	4.63	0.67	Highest level
Average value						4.60	0.10	Highest level

The table III shows the results of the assessment of the usability test as following: the accessibility of the system was 4.81 in average and 0.40 in SD; the appropriateness of the composition was 4.36 in average and 0.67 in SD; the appropriateness of the composition of each spot was 4.63 in average and 0.50 in SD; and the appropriateness of the composition of photos accessibility of the system was 4.63 in average and 0.67 in SD.

TABLE IV: ASSESSMENT OF THE INTEGRITY TEST

Assessment of the Functional Requirement Test	Level of Proficiency (n = 11)						SD	Result
	5	4	3	2	1	\bar{X}		
1. Completion of the system.	10 (50)	1 (4)	0 (0)	0 (0)	0 (0)	4.90	0.30	Highest level
2. Creativeness of the system.	8 (40)	3 (12)	0 (0)	0 (0)	0 (0)	4.72	0.46	Highest level
3. Integrity of the information searching.	7 (35)	3 (12)	0 (0)	0 (0)	0 (0)	4.27	0.50	Highest level
4. Appropriateness of the display.	8 (40)	3 (12)	0 (0)	0 (0)	0 (0)	4.72	0.46	Highest level
Average value						4.65	0.20	Highest level

The table IV shows the results of the assessment of the integrity test and the completion of the system was 4.90 in average and 0.30 in SD. The creativeness of the system was 4.72 in average and 0.46 in SD and the Integrity of the information searching was 4.27 in average and 0.50 in SD. Also, the appropriateness of the display.4.72 in average and 0.46 in SD.

TABLE V: ASSESSMENT OF THE SECURITY TEST

Assessment of the Functional Requirement Test	Level of Proficiency (n = 11)						SD	Result
	5	4	3	2	1	\bar{X}		
1. Prevention for editing on the system.	7 (35)	4 (16)	0 (0)	0 (0)	0 (0)	4.63	0.50	Highest level
2. Accessibility of the user.	9 (45)	2 (8)	0 (0)	0 (0)	0 (0)	4.81	0.46	Highest level
Average value						4.72	0.10	Highest level

The table V shows the results of the assessment of the security test and the prevention for editing on the system was 4.63 in average and 0.50 in SD. The accessibility of the user was 4.81 in average and 0.46 in SD. The average were 4.72 and 0.10 respectively.

V. CONCLUSION

The application development of QR code application on android operating system for helping patients in the hospital would affect to the efficiency of technology and decrease a responsibility of staff. There were 5 system modules; Log-in, Photo, Details which consistent with the need of users, Data Gathering System and System Stability included the application technology. Then tested a satisfaction of sample group by the application and questionnaire for data gathering as the users, and assessed for mean and standard deviation to analyze an overall satisfaction of users that how it was complete and suitable. It was focused on an appreciation of the users on the application system that would cover their needs. The satisfaction assessment of application users revealed that it was in the high level which indicated that a sample group was appreciated in the application covered their needs and the efficiency of hospital. Consequently, it was more convenient for users than going to the hospital, that's the reason of application technology utilized patients in the hospital.

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REFERENCES

1. W. Frawley, G. Piatetsky-Shapiro, and C. Matheus, "Knowledge Discovery in Databases: An Overview". *AI Magazine*, fall, pp. 213-228, 1992.
2. Javatechig, "Rapid Application Development Model", Retrieved from



<http://javatechig.com/se-concepts/rapid-application-development-model>

3. L. Williams, "Testing Overview and Black-Box Testing Techniques", 2006.
4. N. Tachapetpatboon and K.Kularbphettong, "ONTOLOGY BASED KNOWLEDGE MANAGEMENT FOR CULTURAL TOURISM," *Journal of Theoretical & Applied Information Technology*, vol. 75 issue 3, p384-388.
5. R.Rattanachai, S.Luebangyai, and K.Kularbphettong, "Developing a Lifestyle of Thai Buddhist knowledge Mobile Application," *In Proceeding of 6th World Conference on Educational Sciences*, 2014.

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