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JUDUL: IMPLEMENTATION OF WIRELESS ACCESS TO PATIENT INFORMATION SYSTEM

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IMPLEMENTATION OF WIRELESS ACCESS TO PATIENT INFORMATION SYSTEM

SIM SIANG WEI

This report is submitted in partial fulfillment of the requirements for the
Bachelor of Computer Science (Software Engineering)

FACULTY OF INFORMATION AND COMMUNICATIONS TECHNOLOGY
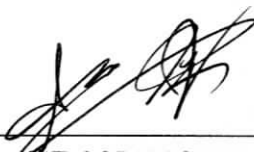KOLEJ UNIVERSITI TEKNIKAL KEBANGSAAN MALAYSIA
2005

DECLARATION

I hereby that this project report entitled

IMPLEMENTATION OF WIRELESS ACCESS TO PATIENT INFORMATION SYSTEM

is written by me and is my own effort and that no part has been plagiarized

without citations.

STUDENT : _____ Date: 23 Nov 2005
       (SIM SIANG WEI)

SUPERVISOR : _____ Date: _____
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DEDICATION

To My Family and Friends

ACKNOWLEDGEMENTS

This project is the culmination five months of work. Before beginning of this project, I have done a lot of study and survey on what should this PSM to be done and what title should propose. So at last this title have been proposed and approved by the PSM committee and been implemented as the project output.

After the completion of the PSM project I would like to send my first appreciation to my PSM supervisor Mr. Khanapi Abdul Ghani which have provide me the guidance to complete this PSM project and to share his technical knowledge to easier my task during the design phase and analyst phase.

I want to take this opportunity to thanks the board of committees for this PSM, which have organize this subject in such systematic and well manage. Like example the PSM committees have organize a seminar during 4th of April 2005 at Lecture Hall 9 to give PSM student a overview and idea of what should be done and how it can be done.

Beside that I would like to say thanks my fellow friends, course mates, classmates and house mates that have share knowledge and idea among each other to let me have a chance complete my report in such a different way.

From here I would like to give a great deal of thanks to external organization such as The Southern Hospital Melaka, Polyclinic Ayeh Keroh, Hospital Pantai Melaka and General Hospital Melaka which have given a chance for me to have an interview with their organization or personal. It has been a big help to provide the material, idea and time to make this report more complete and perfect.

Lastly I would like to give my big thanks to my family which has give me a lot of moral support and give me more strength to complete this project to full fill the PSM subject.

Thank you.

ABSTRACT

This project papers is record for the Implementation of Wireless Access to Patient Information System. It works to record the process of development and implementation on Patient Information System from the beginning until ending of the PSM. Patient Information System that have been discuss in this paper will eliminate the system constraint that happen to the current system, such as system availability and accessibility of the system and data. In this project papers will design a new framework that will use the latest wireless technology to increase the availability of the patient information. In chapter one will record overview of this project and it will follow up by list out the problem statements of current system having. It will also state the objectives and scopes of the project. After reading the first chapter the reader will have the brief idea for what purpose this project title have been proposed. For chapter two, it will record down the literature review of title bout the current medical system availability problem issues and methodology that will be use to complete this PSM project. After define the project methodology the project schedule and milestone will also plan. Chapter three, analyst will separate into two major parts which are analyzed of current system and to-be system. In current system, it will produce a set of system architecture, business flow and problem statements of the current system. For to-be system will be included with the functional requirement, software requirement, hardware requirement and network requirement. Chapter four will discuss activities and result of the high level-design of the system and prototype. The item that been highlighted in this chapter are design of the input, output, interface, system architecture, static organization, high-level class diagram, database design and detail design. Chapter five will record down all the implementation process that has been done while developing this project and testing chapter will defined all the testing process. The last chapter will summarized this paper and future development of the project.

ABSTRAK

Laporan projek ini adalah untuk merekodkan perlaksanaan projek Pengimplementasi Capaian Tanpa Wayar ke Sistem Maklumat Pesakit. Tugas utama laporan ini adalah untuk mencatat segala pembangunan dan perlaksanaan projek ini dari mula hingga ke akhir PSM. sistem yang bakat dihasil kemudian akan menghapuskan kelemahan sistem sekerang seperti kewujudan sistem dan keupayaan akcess sistem. Projek ini akan menghasilkan satu rangka kerja yang mengunakkan teknologi tanpa wayar terbaru untuk menambahkan kewujudan maklumat pesakit. Bab pertama akan menerangkan pandangan secara keseluruhan untuk projek ini. Ia juga merangkumi objektif dan skop projek. Selepas membaca bab ini, pembaca akan memahami tujuan pembangunan projek ini. Untuk bab kedua ia akan menerangkan aktiviti kajian literaktur dan metodologi perlaksanaan pembangunan. Pada bahagian akhir bab ini ia akan melampirkan jadual perlaksanaan project dan Gantt Chart. Bab seterusnya adalah bab analisis, bab ini akan menyertakan dengan secara mendalam pada aktiviti dan proses kajian sistem. Ia merangkumi perlaksanaan kajian dan hasil daripada kajian tersebut. Bab empat akan menerangkan rekabentuk sistem secara ringkas (*high-level design*) dan terperinci. Kandugan dalam bab ini akan termasuk rekabentuk input, output, perantaramuka, rangka arkitektur sistem, organisasi tetap, pangkalan data dan rekabentuk sistem terperinci. Bab seterusnya perlaksanaan sistem dan pengujian sistem akan merekodkan proses kerja pembangunan dan percubaan untuk sistem tersebut. Bab yang terakhir menjadi sebagai penutup dan ia akan melampirkan segala kebaikan, kekurangan, kelemahan dan penutup kertas kerja projek ini.

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Abbreviation	Description
CPR	Computer-based Patient Record
EPD	Electronic Patient Device
GHz	Giga Hertz
GSM	Global System for Mobile Communication
HL7	Health Level 7
HPD	Health Care Provider Device
IBM	International Business Machine
ICT	Information Computer Technology
IrDA	Infra-red Direct Adapter
IEEE	Institute of Electrical and Electronic Engineering
JDBC	Java Database Connection
JDK	Java Development Kit
JRE	Java Runtime Environment
J2ME	Java 2 Micro Edition
KLOC	Kilo Line of Code
KUTKM	Kolej Universiti Teknikal Kebangsaan Malaysia
LAN	Local Area Network
Mbps	Mega bits per second
OOAD	Object Oriented Analysis and Design
PCMCIA	Personal Computer Memory Card International Association
PDA	Personal Digital Assistant
PIF	Patient Information Folder
PIS	Patient Information System
RDBMS	Relational Database Management System
SMS	Short Messaging Service
UML	Unified Modeling Language
USB	Universal Serial Bus
GB	Gigabyte
NA	Not Applicable or Not Available

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CHAPTER I

INTRODUCTION

1.1 Project Background

Today the Information Communication Technology (ICT) have come into out human life and playing the major role in our daily task. ICT does give advantages to a lot of industry and field but when ICT run into the medical field have not giving a big help to the patient, but indirectly it have cause the lost of human life and money due to the reason of lack of patient information while critical situation.

As the project title mention this project will be developed is under the medical industry. Main purpose of the system is used to keep the patient information for the particular clinic or health care center. The difference with this project if compare the current Patient Information System is that the new designed framework will included with new technology that make use of the wireless device such as Infrared and Mobile Devices for keeping summary of patient information and provide disaster avoidance services . The needs of this project it to implement the new technology such as Wireless (Infrared) and Mobile Device to increase the availability of the patient information for the medical personal.

From the study of the medical field journal and educational theses from the

professional group or non-government organization, the lacks of patient information have caused the situation of medical mistakes happen. The result of the medical mistake has kill thousand of people and cost an estimated US$37 billion dollars according to Institute of Medicine (1998). In order to decrease the medical mistake, this project has been proposed to use the mobile devices that belong to the patient for keep the patient information. So whenever the information is needed for the emergency treatment, the medical personal can just refer to the information from the patient mobile devices without have to re-measure the patient health record or status for secure the patient critical situation.

Beside that current system that is used by the medical centre only keeps the record of patient individually for their own registered patient. So that will be a problem when emergency happened to a patient which is not registered to the clinic because they don't have the health record for the patient and this will delayed the consultation process which it may effect the patient health or life.

Current system having problems which are; if a patient having a emergency situation then the medical person such as doctor don't have the patient information then they may need to re-measure the patient medical record which is required. That will take some times to do all the process again. So if the medical person already having the medical record of the patient then it may be able to reduce the treatment time for the patient. This is a critical problem because sometime the difference between life and death is just a second or minute. Second situation is the availability of the hospital database, if hospital patient information database are out of service then the medical team maybe no be able to retrieve the patient information from the server. This will result the medical team need to use the manual way to doing their task which this may take longer time to process a single transaction.

1.2 Problem Statements

- Inadequate system availability and alternative recovery services

In today world most of the medical related field have already apply ICT services into their medical system. Examples are consultation system, patient information system, hospital staff management system, telemedicine system, emergency system and etc. Although those ICT services have give advantages to the medical department by providing ease of processing the daily task and management of the medical operation process but it also have been reported giving a big constraint to the medical department. The constraints that mention are system availability. In ICT world, machine or computer is not human or hardcopy record. Computer or machine can break down anytime and cause the medical system can't be use by the medical personal, where human and hardcopy record are different that the availability of the record and data are more accessible if compare to computer or machine. Like the situation if a medical person that work at the front desk are not available while his services is needed, then his task can be taken by his colleague. This can ensure the availability of the service to the patient. If computer then patient will facing problem when the server of the medical system is break down, then the medical personal may have difficulty to access to the patient information. This may force the medical person to re-measure the situation of the patient and this may cause big problem if emergency situation occur. Sometime the differences of life or death are just gap of second or minute.

- Data Accuracy and Data Integrity of the Patient Information

From the study in today medical field, they are still predominantly paper records or hardcopy records. Although the investment of more then 30 years of

exploratory work and million of dollars in research and implementation of ICT services in medical fields according to R.S Dick from National Academy Press (1997). Beside that Health Level 7 (HL7) standard also been created for standardized the interfaces of the medical data exchange but the medical fields still not fully in trust of the ICT services. As a solid example the PIF 1998 (Patient Information Folder) that been developed in consultation with clinicians in the UK and US and evaluated by a group of GPs from General London, the document only record as trial system and never been record is deploy official in any clinic or hospital up to today according to Richard I. Kitney and C. Forbes Dewey Junior (1998). My study from the internet search result has proved the system is still in discussion. The reasons behind this situation are reliable and accuracy of the patient data. The important of the medical record of data are too sensitive for the patient, so the medical field can't rely on the system where the current system still can't afford to take up the responsible. So this project is looking forward to create better system framework for the medical field which if can provide to meet satisfaction of the data accuracy, data integrity and system reliability.

- Lack of patient information.

The patient information will normally stored in the patient information system electronically in the computer, patient information will store in computer databases at the medical center but if timely access to his record is often impossible. Reasons are the infrastructure required to communicate with the database is not available or the medical personal are not able to identify the patient to the infrastructure. If this situation meets up with emergency situation then it might be serious which may cause human life. As the previous chapter stated the lacking of patient information have result the happen of medical mistake and it have also cause human life. This project should be able to come out with solution to avoid the scenario as above to be happen.

1.3 Objective

The system that the medical department having now is only meant to be used when the server and system terminal is in good condition, if once the server having problem such as system failure or power break down then the system may lost the capability to provide the medical person bout the patient medical history. Beside that it will also affect the process such as data enquiry for other medical data. This will be very critical if a patient is having an emergency situation and the medical person need to measure all medical status again before giving the proper treatment to the patient. The prior mentioned situation may cause danger for the patient life. Due to the research and study to the situation above the main objective of this project have been set such as listed below:

- Store the patient information into the portable devices

The patient information summary will be kept in the portable device should be useful for the patient when carrying out medical consultation at other medical center. The transmission of the data will be from the system to the portable device will be using the infrared communication which is wireless and can be interact in between of 1 to 20 centimeters. The problem of lacking patient information can be avoided while emergency happen and the patient are carry with the portable device that have stored with the patient information summary. Then the medical personal can refer to the patient information that kept in portable device and speed up the medication operation. Beside using the infrared technology the development team have think of the constraint that may happen some group of user that don't have the portable device that with infrared infrastructure. So the idea to eliminate this constraint is by using the SMS (Short Message Service). The SMS will be sending to the user portable devices in a direct readable format by using the GSM services.

- Provide an alternative storage on the medical terminal

The system terminal (client) will have a copy of latest patient data in the local system to react as a backup copy of the system database. The size of the local database will be small and portable. The local database will be used when ever the system terminal (client) is out of connection with the server or system database (Life-time Information). The system terminal (client) also need to equip with the function that to detect the availability of the system database (server). With the alternative database keep in the local system terminal (client) it can use while the system database is out of service or not available, at the same time this have already avoid the unavailable of the Patient Information System and also increased the system availability and accessibility.

- To enable the client system to operate independently

The system terminal or client will be capable to operate without system database (server) when the server is offline or breakdown. The client will run without server and using the local database. The client also can retrieve the patient information from the patient portable devices if the patient information were not in the local database. This will increase the availability and accessibility of the system to the user of the system.

- To ensure the data integrity and data accuracy of the system database

The information that keeps in the local terminal (client) must be update to the system database if the data are not found in the system database. The summary information of the system database should update to the system terminal (client) by schedule that set by system administrator. The mobile devices that belong to the

patient should keep the latest patient information summary that which is tally with the system database. This will solve the problem of the data accuracy and data integrity of Patient Information System and build up the confident of the patient to the system.

1.4 Scopes

Develop one prototype system which will include new designed framework for the PIS (Patient Information System). Deliverables of the project will be a complete system that will meet the objective that been listed in the previous chapter. The system will separate into two major parts which is the back end and front end. Front end will be the system terminal. A software application will be develop for the user to interact with the data or patient information.

The front end application will also capable to detect the server, switch to using mobile data and communicate with the patient portable device via infrared. For the back end, will consist of the business layer which it will have the controller application that communicate the front end with the data services level. The front end and business logic will reside at the client terminal and the data services will be at reside at server side. The module that will be developed will be Patient Information Module, Get Patient Information Module, Put Patient Information Module and Server Detector Module.

The system will be deployed for trial purpose at any of the medical center (real-life/prototype) which is applicable for their usage during the project implementation and testing phase. Doctor, nurse and other medical center staff will be selected as the main user, for this project which all the business and user

requirement will be retrieve from them. The domain of project will be under the medical field and specifically in Patient Information System.

Approximately this project will need to take around 4 month to complete and the KLOC will be around 10 to 20 for each module of the system. The project will be developed using JAVA based Application and Development Tools which is platform independent. The RDBMS will be used to keep the data is MySQL database. The reason is because the MySQL is easy to be implemented together with the JAVA application and open source license.

This project will be developed internally during implementing phase and internal testing phase. Other such as the capture requirement phase, testing phase and deployment phase will need the external assistance such as the user to be involved to ensure the system are develop follow the satisfaction of the user and not the developer.

The technology that will be use in this project is Infrared which it will be function as the connection bridge for the system terminal and the patient portable devices for transfer patient information summary. The system will also equip with one controller that will use for system terminal to detect the server status.

The constraint of the project is the technical reference and implementation knowledge. Where the knowledge of the JAVA based development are not enough for the development team and the technical reference for the portable devices are still not available for the development team to study. For this project the security concern of the system will be not included.

1.5 Project Significance

As traditional the benefits of the Patient Information System are provides distinct identifying information for each patient, and identifiers to locate the digital record among any number of other records. Beside that it's also provides quick access by date of visit, provider, or other search criteria and the ability to browse by diagnosis and prescription.

The report generation function in the Patient Information System also can benefit the medical staff in doing their daily analysis work or any or the report is required. The medical staff such as doctor, nurse or medical clerk can process their daily task more flexible if compare to current system. Beside the system benefits above the project framework also will benefit the medical field which it maybe can increase the availability of the Patient Information System and also the patient information.

The increase of the availability and accessibility of the Patient Information System can speed up the daily process and performance for medical center. Wireless portable device that carried the personal patient information summary also will help the paramedic team to identify the patient information and medical history.

While any of the emergencies happen and the casualty is unconscious without have to re-measure or identify the casualty again while may take some time to do the process.