

BORANG PENGESAHAN STATUS TESIS

JUDUL : Telemedicine System for Rural Clinic
SESI PENGAJIAN : 2012

Saya LIM CHIT WOOL mengaku membenarkan tesis (PSM/Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dengan syarat-syarat kegunaan seperti berikut:

1. Tesis dan projek adalah hakmilik Kolej Universiti Teknikal Kebangsaan Malaysia.
2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. ** Sila tandakan (/)

<u> </u>	SULIT	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
<u> </u>	TERHAD	(Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
<u> ✓ </u>	TIDAK TERHAD	


(TANDATANGAN PENULIS)

Alamat tetap : 3F, Jalan Wawasan 2/2,
Bandar Baru Ampang,
68000 Selangor

Tarikh : 28th August 2012


(TANDATANGAN PENYELIA)

PN. HIDAYAH BINTI RAHMALAN

Tarikh: _____

CATATAN: * Tesis dimaksudkan sebagai Laporan Akhir Projek Sarjana Muda (PSM).

** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.

TELEMEDICINE SYSTEM FOR RURAL CLINIC

LIM CHIT WOUI

**This report is submitted in partial fulfillment of the requirements for the
Bachelor of Computer Science (Database Management)**

**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA**


2012

DECLARATION

I hereby declare that this project report entitled
TELEMEDICINE SYSTEM for RURAL CLINIC
(TSfRC)

Is written by me and is my own effort and that no part has been plagiarized without
citations.


STUDENT :



Date : 28th August 2012

(LIM CHIT WOO)

SUPERVISOR :



Date : _____

(PN. HIDAYAH BINTI RAHMALAN)

DEDICATION

This report is dedicated to my beloved parents, friends and supervisors who have provided encouragement and guidance all the way during the completion of the report.

ACKNOWLEDGEMENTS

I would like to thank Pn. Hidayah Binti Rahmalan for giving assistant to complete this project. She has been giving many valuable opinions during me working on this project.

I would also like to thank my friends that have helped me throughout my project. Their assistant has lightened my works.

ABSTRACT

The purpose of this project is to create a platform which enables doctors from rural clinics to interact and get opinion from experts. The current system Teleconsultation (TC) is a system enables doctors from different hospital sharing treatment information of patient to get assist from other doctors or experts. However, this function currently is only focus on few medical fields such as cardiology, dermatology, neurosurgery, and radiology. Besides that, it also involves hospital only as the requirement equipment is not available in rural clinic. Hence, Telemedicine System for Rural Clinic is developed by hoping that doctors from rural clinic also can have the chance to get assistance from other doctors or experts. The development methodology used in this project is Database System Development Life Cycle (DSDLC). It helps to clearly define the steps for develop system and database. The scope of this system is enable users to manage the patient treatment information and interact with other doctors for discuss about the problems during doing treatment for their patients. As the result of testing, this system is basically had meet the objectives which set during the planning phase. The conclusion for this project is the system needs improvement on user friendly issue and enhancement to import patient treatment information regardless of any kind of formatting file. Besides that, this system also may provide some extra functions such as enable users to access the system with mobile phones since the usage of mobile phone is common and convenient.

ABSTRAK

Tujuan utama projek ini adalah menyediakan satu platform untuk doktor-doktor dari klinik desa berkomunikasi dengan doktor atau pakar dari hospital. Sistem yang sedia ada iaitu Teleconsultation ialah system yang membolehkan doktor-doktor dari hospital yang berbeza dapat mengkongsikan maklumat rawatan pesakit sesama lain untuk mendapatkan bantuan daripada doktor lain. Namun sistem ini hanya meliputi beberapa kepakaran seperti kardiologi, dermatologi, pembedahan neuro dan radiologi. Selain itu, sistem ini juga diutamakan di antara hospital atas sebab peralatan keperluan sistem ini jarang disediakan di klinik desa. Oleh itu, Telemedicine System for Rural Clinic dibangunkan dengan harapnya doktor-doktor dari klinik desa turut berpeluang mendapatkan bantuan daripada doktor lain. Methodologi yang digunakan untuk membangunkan sistem ini adalah Database System Development Life Cycle (DSDLC). DSDLC membantu dalam menentukan langkah-langkah untuk membangunkan sistem ini. Skop sistem ini membolehkan pengguna menguruskan maklumat rawatan pesakit dan berinteraksi dengan doktor yang lain. Keputusan pengujian terhadap sistem ini menunjukkan sistem ini telah memenuhi objektif. Secara kesimpulannya, sistem ini boleh dibuat penambahbaikan memudahkan cara bagi pengguna dan fungsi mengimport maklumat rawatan pesakit tidak mengira format file. Selain itu, sistem ini juga boleh menambah fungsi seperti pengguna boleh menggunakan sistem ini melalui telefon bimbit.

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
	ADMISSION	i
	DEDICATION	ii
	ACKNOWLEDGEMENTS	iii
	ABSTRACT	iv
	ABSTRAK	v
	TABLE OF CONTENTS	viii
	LIST OF TABLES	ix
	LIST OF FIGURES	x
	LIST OF ABBREVIATIONS	xiii
CHAPTER I	INTRODUCTION	
	1.1 Overview	1
	1.2 Problem Statements	2
	1.3 Objectives	2
	1.4 Scopes	2
	1.5 Contributions	3
	1.6 Expected Output	3
	1.7 Conclusion	3
CHAPTER II	LITERATURE REVIEW AND PROJECT METHODOLOGY	
	2.1 Introduction	4
	2.2 Fact and Finding	5
	2.2.1 Domain	8
	2.2.2 Telemedicine	8
	2.2.3 Existing System	8
	2.2.3.1 Teleconsultation	8
	2.3 Project Methodology	9
	2.3.1 Database Planning	10
	2.3.2 System Definition	11

	2.3.3	Requirement Collection and Analysis	11
	2.3.4	Database Design	12
	2.3.5	DBMS Selection	12
	2.3.6	Application Design	13
	2.3.7	Prototyping	13
	2.3.8	Implementation	14
	2.3.9	Data Conversion and Loading	14
	2.3.10	Testing	14
	2.3.11	Operational Maintenance	15
	2.4	High-Level Project Requirement	15
	2.4.1	Software Requirement	15
	2.4.2	Hardware Requirement	15
	2.5	Project Schedule and Milestones	16
	2.6	Conclusion	16
CHAPTER III		ANALYSIS	
	3.1	Introduction	17
	3.2	Analysis of Current System	18
	3.3	Analysis of To Be System	22
	3.4	Conclusion	30
CHAPTER IV		DESIGN	
	4.1	Introduction	31
	4.2	High-Level Design	32
	4.2.1	System Architecture	32
	4.2.2	User Interface Design	33
	4.2.2.1	Navigation Design	33
	4.2.2.2	Input Design	34
	4.2.2.3	Output Design	34
	4.2.3	Database Design	34
	4.2.3.1	Conceptual and Logical Database Design	34
	4.3	Detailed Design	35

	4.3.1	Software Specification	35
	4.3.2	Physical Database Design	35
	4.4	Conclusion	41
CHAPTER V		IMPLEMENTATION	
	5.1	Introduction	42
	5.2	Software Development Environment Setup	42
	5.3	Database Implementation	44
	5.4	Software Configuration Management	46
	5.4.1	Configuration Environment Setup	46
	5.4.2	Version Control Procedure	47
	5.5	Implementation Status	48
	5.6	Conclusion	49
CHAPTER VI		TESTING	
	6.1	Introduction	50
	6.2	Test Plan	50
	6.2.1	Test Organization	51
	6.2.2	Test Environment	51
	6.2.3	Test Schedule	52
	6.3	Test Strategy	52
	6.3.1	Classes of Tests	53
	6.4	Test Design	54
	6.4.1	Test Description	54
	6.4.2	Test Data	54
	6.5	Test Result and Analysis	55
	6.6	Conclusion	55
CHAPTER VII		PROJECT CONCLUSION	
	7.1	Observation on Weakness and Strengths	56
	7.2	Proposition for Improvement	57
	7.3	Contribution	57
	7.4	Conclusion	57
		REFERENCES	58

LIST OF TABLES

TABLE	TITLE	PAGE
2.1	Rural Clinic's Contact and Information	5
3.1	TC System's Network	18
3.2	TC Hardware's Requirement	20
5.1	Software Development Environment	43
5.2	Server Configuration	43
5.3	Database Environment Setup	43
5.4	Version Control Procedure	47
5.5	Implementation Status	48
6.1	Test Organization	51
6.2	Test Environment	51
6.3	Test Schedule	52
B.1	Project Schedule and Milestone	64
E.1	Input Design	80
H.1	Data Dictionary	99
J.1	Test Description for Login	111
J.2	Test Description for Sign Up	111
J.3	Test Description for Forgot Password	111
J.4	Test Description for Update User Information	112
J.5	Test Description for Delete User Information	112
J.6	Test Description for Insert Patient and Treatment Information	113
J.7	Test Description for Delete Patient and Treatment Information	113
J.8	Test Description for Update Patient and Treatment Information	114
J.9	Test Description for Create Topic	114
J.10	Test Description for Post Reply	115
K.1	Test Result for All Test Cases	117

LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	Database System Development Life Cycle	11
3.1	Flow Chart of TC System	21
3.2	Flow Chart for Login	22
3.3	Flow Chart for Administrator (1)	23
3.4	Flow Chart for Administrator (2)	24
3.5	Flow Chart for Normal User (1)	25
3.6	Flow Chart for Normal User (2)	26
3.7	DFD Context Diagram	27
3.8	DFD Level 0	28
3.9	DFD Level 1 for Process 3	29
3.10	DFD Level 1 for Process 4	29
4.1	Two Tier Client Server Architecture	32
4.2	Navigation Flow	33
5.1	Environment Architecture	44
A.1	Distribution of the TeleCardiology Network	60
A.2	Distribution of TeleDermatology Network	60
A.3	Distribution of TeleNeurosurgery Network	61
A.4	Distribution of TeleRadiology Network	61
A.5	Schematic Drawing of the Network for TC	62
A.6	Hardware Used by Sending Sites and Receiving Sites	62
C.1	Demonstration of TC 1	66
C.2	Demonstration of TC 2	66
C.3	Demonstration of TC 3	67
C.4	Demonstration of TC 4	67
C.5	Demonstration of TC 5	68
C.6	Demonstration of TC 6	68
C.7	Demonstration of TC 7	69

C.8	Demonstration of TC 8	69
C.9	Demonstration of TC 9	70
C.10	Demonstration of TC 10	70
C.11	Demonstration of TC 11	71
C.12	Demonstration of TC 12	71
C.13	Demonstration of TC 13	72
C.14	Demonstration of TC 14	72
C.15	Demonstration of TC 15	73
C.16	Demonstration of TC 16	73
C.17	Demonstration of TC 17	74
C.18	Demonstration of TC 18	74
C.19	Demonstration of TC 19	75
C.20	Demonstration of TC 20	75
D.1	Sidebar of TSfRC	77
D.2	Alert if Not Login	77
F.1	Not Filling Up All Information	82
F.2	Incorrect Username or Password	82
F.3	Transaction Success	82
F.4	Confirmation Box	83
F.5	Record Generated	83
G.1	ERD	87
I.1	Login Page	93
I.2	Sign Up Page	95
I.3	Forgot Password Page	96
I.4	Doctor Information Page	96
I.5	Doctor Detail Page	98
I.6	Inbox Page	98
I.7	New Message Page	99
I.8	BackUp and Recovery Page	100
I.9	Import Patient Information Page	101
I.10	Patient Record Page	103
I.11	Patient Detail Page	105
I.12	Update Patient Page	106
I.13	Medicine List Page	107

I.14	Discussion Board Message	106
I.15	Create New Topic Page	107
I.16	Reply Topic Page	108
L.1	Sidebar	118
L.2	Login Page	118
L.3	Sign Up Page	119
L.4	Forgot Password	119
L.5	Doctor Information Page	120
L.6	Doctor Information Page (2)	120
L.7	Doctor Detail Page	121
L.8	Back Up and Recovery Page	121
L.9	Back Up and Recovery Page (2)	122
L.10	Import Patient Information	122
L.11	Import Patient Information (format of text file)	123
L.12	Inbox Page	124
L.13	Message	124
L.14	New Message Page	125
L.15	New Message Page (2)	125
L.16	Medical List Page	126
L.17	Import Medicine Information	126
L.18	Import Medicine Information (format of text file)	126
L.19	Medicine Detail	127
L.20	Discussion Board Page	127
L.21	Create New Topic	127
L.22	Topic Created	138
L.23	Topic Created (2)	138
L.24	Topic Created (3)	129
L.25	Reply Post	129
L.26	Reply Post (20)	130

LIST OF ABBREVIATIONS

DFD – Data Flow Diagram

ERD- Entity Relationship Diagram

TC – Teleconsultation

TSfRC – Telemedicine System for Rural Clinic

CHAPTER I

INTRODUCTION

1.1 Overview

Telemedicine System for Rural Clinics (TSfRC) is a system that builds to assist doctor at village for give treatment for their patient. It is known that the rural clinic were lack of facility or information needed by doctor. As sometimes, the doctors need a second opinion from the experts to handle or take care of the patient.

Rural clinic were normally located at the village while hospital was located at the city. The distance between rural clinic and hospital is the one reason why this system should be implemented. TSfRC may reduce cost and time to get the appropriate treatment since the patient were among the villagers and maybe they were unfortunate and do not have the transportation to go to the hospital at the city.

The doctor can take the picture of the patient and will upload it into TSfRC. Besides that, the doctor will record the patient's treatment information into the system. At the other sides, the experts may retrieve the picture and the treatment information of the particular patient. After reviewing the records, the experts may give his opinion to the doctor about the disease and may prescribe the suitable medicine and appropriate treatment to give to that the patient. Hence, TSfRC may provide a convenient environment of healthcare institutions and offer the facility among the villagers, the doctors, and the experts.

1.2 Problem Statements

1. Doctors of rural clinics do not have specific knowledge on particular disease and may face difficulty when patient need treatment.
2. Time and money consuming if patients purposely go to hospital seek for treatment while their situation are not serious.

1.3 Objectives

1. To provide a platform which enable doctors from rural clinics interact and get opinion from experts.
2. To save patients' time and money by provide proper treatment at rural clinics.

1.4 Scopes

1. User

- a. Administrator – login, register user, modify record, insert patient information, comment
- b. Doctor – login, register, update own record, insert patient information, comment

2. Module / Function

- a. User Authentication -User login to use the system by using login username and login password
- b. User Information - After login, administrator can register new user, update user information except login information, delete user, and lock

user's account. Doctor without admin role can sign up, view other doctor basic information, and edit own record.

- c. Medicine Information – Database of medicine. User can search for medicine information.
- d. Patients' Record – User can insert new patient information, edit own patient information, and view other doctors' patient.
- e. Private Messages – User can send and receive private messages among themselves.
- f. Discussion Board – User can create topic to ask question or opinion. Other users may post reply to answer the posted topic.

1.5 Contributions

- a. Doctors from rural clinics able to get opinion from other doctors who specialize in particular specialty.
- b. Patients able to get proper treatment at rural clinics.

1.6 Expected Output

TSfRC is developed to help doctors from rural clinics get opinion from specialist. They can provide proper treatment for patient who may help them save cost and time as those patients from village may not affordable to get treatment at hospital located in city.

1.7 Conclusion

TSfRC is a system able to help doctors from rural clinics provides proper treatment for patients in village. It let those villagers who are unable to afford high medical fees at hospital also able to receive treatment. Next chapter will discuss about literature review and methodology of the project.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

Rural clinics are clinic which place in rural area to ensure the healthcare of residents in rural area are take cared. Malaysia has one of the best rural health services in the world as there is a health clinic every five kilometers of the county. According to list of government clinic by Ministry Of Health Malaysia's official portal, there are around 61 rural clinics for Malacca. These rural clinics provide services such as curative, family health, dental, nutrition and dietetics, health education and promotion, home nursing, care of elderly, rehabilitative services, environmental sanitation, adolescent health and community mental services.

This chapter will involve activities such as fact and finding which look for information that related to the title, project methodology that describe the methodology which is used in develop the system, project requirement which state out the software and hardware that needed during the developing of system, and the project schedule and milestones which help plan and ensure the activities being carried out according time so that the system can be done in time.

2.2 Fact and Finding

The table below shows some research on the rural clinic in Malacca area. These data obtained by search information of these clinics from internet.

Table 2.1: Rural Clinic's Contact and Information

Clinic	Facebook	Personal Website	Telephone	E-mail
Klinik Desa Air Molek	X	X	√	X
Klinik Desa Air Paabas	X	X	√	X
Klinik Desa Asahan	X	X	√	X
Klinik Desa Ayer Merbau	X	X	√	X
Klinik Desa Ayer Tawar	X	X	√	X
Klinik Desa Bachang	√	X	√	X
Klinik Desa Batang Melaka	X	X	√	X
Klinik Desa Batu Berendam	√	X	√	X
Klinik Desa Batu Gajah Pasir	X	X	√	X
Klinik Desa Belimbing Dalam	X	X	√	X
Klinik Desa Bemban	√	X	√	X
Klinik Desa Bertam Ulu	X	X	√	X
Klinik Desa Brisu	X	X	√	X
Klinik Desa Bukit Katil	√	X	√	X

Klinik Desa Bukit Piatu	√	X	√	X
Klinik Desa Bukit Senggeh (Felda)	X	X	√	X
Klinik Desa Chenderah	X	X	√	X
Klinik Desa Chin Chin	X	X	√	X
Klinik Desa Durian Daun	X	X	√	X
Klinik Desa Gadek	X	X	√	X
Klinik Desa Kampong Padang	X	X	√	X
Klinik Desa Kampong Pulau	X	X	√	X
Klinik Desa Kampung Tehel	X	X	√	X
Klinik Desa Kesang Pajak	X	X	√	X
Klinik Desa Kesang Tua	X	X	√	X
Klinik Desa Krubong	X	X	√	X
Klinik Desa Kuala Linggi	X	X	√	X
Klinik Desa Lendu	X	X	√	X
Klinik Desa Macap Umboo	X	X	√	X
Klinik Desa Masjid Baru	X	X	√	X
Klinik Desa Melaka Pindah	√	X	√	X
Klinik Desa Melekek	X	X	√	X
Klinik Desa Nyalas	X	X	√	X
Klinik Desa On Lok	X	X	√	X

Klinik Desa Padang Sebang	X	X	√	X
Klinik Desa Pantai Belimbing	X	X	√	X
Klinik Desa Pantai Kundor	X	X	√	X
Klinik Desa Parit Gantong	X	X	√	X
Klinik Desa Paya Dalam	X	X	√	X
Klinik Desa Paya Rumput	√	X	√	X
Klinik Desa Pegoh	X	X	√	X
Klinik Desa Pengkalan Balak	X	X	√	X
Klinik Desa Pulau	X	X	√	X
Klinik Desa Pulau Sebang	X	X	√	X
Klinik Desa Ramuan China Besar	X	X	√	X
Klinik Desa Rembia	X	X	√	X
Klinik Desa Sebatu	X	X	√	X
Klinik Desa Semabok	√	X	√	X
Klinik Desa Semujuk (Felcra)	X	X	√	X
Klinik Desa Simpang Kerayong	X	X	√	X
Klinik Desa Solok Menggong	X	X	√	X
Klinik Desa Sungai Buluh	X	X	√	X
Klinik Desa Sungai Petai	X	X	√	X
Klinik Desa Sungai Siput	X	X	√	X
Klinik Desa Taboh Naning	X	X	√	X
Klinik Desa Tangga Batu	X	X	√	X
Klinik Desa Tanjung Bidara	X	X	√	X
Klinik Desa Tebong	X	X	√	X
Klinik Desa Tedong	X	X	√	X
Klinik Desa Telok Mas	X	X	√	X
Klinik Desa Tiang Dua	X	X	√	X

2.2.1 Domain

The domain of this system is medical healthcare. It will be used by the doctors from rural clinics and doctors from hospital in city who are specialize in their specialty.

2.2.2 Telemedicine

Telemedicine is the use of telecommunication and information technologies to provide clinical healthcare at a distance. It helps improve the medical service especially for the rural communities far away from cities. In Malaysia, the telemedicine concept is still under development progress. Over the years, some telemedicine projects like 'Mass Customized Personalized Health Information and Education (MCPHIE)', 'Continuing Medical Education', and 'Teleconsultation' have been conducted.

2.2.3 Existing System

2.2.3.1 Teleconsultation

Teleconsultation (TC) is a system which connects healthcare providers in a multipoint place to share opinions. It was launched as one of the national flagship

application in April 2000 with the hope to virtually expand the clinical service and expertise to rural and remote areas thus to improve quality of national healthcare.

However, teleconsultation in Malaysia had not been embraced due to some implementation and adoption barrier which include the infrastructure needed for the application, and special training needed for the users. As the result, the contracts with 41 hospital and health clinics which start in year 2000 were ended in 2002. After 4 years lapse, the contracts only renewed as the project is gradually being realized and transpired.

A network of nationwide Teleconsultation was created for the disciplines of neurosurgery, radiology, cardiology, and dermatology. Please refer to Appendices A.

2.3 Project Methodology

Database System Development Life Cycle (DSDLC)

The Software Development Life Cycle (SDLC) is the structure approach used in development, creation, and maintenance of an information system (IS). As database is fundamental component of an IS, DSDLC had been introduced. DSDLC consists of 11 main phase which are database planning, system definition, requirements collection and analysis, database design, database management system (DBMS) selection, application design, prototyping, implementation, data conversion and loading, testing, and operational maintenance.