



**INTEGRATED TELEHOMECARE SYSTEM  
FRAMEWORK FOR SEAMLESS ACCESS TO  
HEALTH RECORDS**



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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DOCTOR OF PHILOSOPHY**

**2021**



**Faculty of Information and Communication Technology**



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**Doctor of Philosophy**

**2021**

**INTEGRATED TELEHOMECARE SYSTEM FRAMEWORK FOR SEAMLESS  
ACCESS TO HEALTH RECORDS**

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**A thesis submitted  
in fulfillment of the requirements for the degree of Doctor of Philosophy**



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**2021**

## DECLARATION

I declare that this thesis entitled “Integrated Telehomecare System Framework for Seamless Access to Health Records” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.



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## APPROVAL

I hereby declare that I have read this thesis and in my opinion this thesis is sufficient in terms of scope and quality for the award of Doctor of Philosophy.



Signature : .....

Supervisor Name : PROF. DR. MOHD KHANAPI BIN ABD. GHANI

Date : .....

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## DEDICATION

For the sake of Allah S.W.T my Creator, my great messenger, Muhammad S.A.W who taught us the purposes of life. This project is dedicated to my parents for the unconditional support that they gave me during my studies. I am thankful to have parents, Zainal Abidin bin Haji Sha'ari and Rapeah binti Umor that always giving me a chance to prove and improve me myself through all my walks of life. To my loved husband, Mohd Fairuz binti Taib the person who is always giving me the strength to fulfill all my goals, keep support me during my bad and good time and allowing me to further my studies. My children, Farish Wafri and Farisha Umayrah who has endured me during this period. I also would like to thank my supervisors, particularly Prof. Dr. Mohd Khanapi bin Abd Ghani, lecturers, family and friends who have together supported each other throughout this period. I will always appreciate the friendship and guidance received.

## ABSTRACT

The number of patients suffering from chronic diseases is increasing in every hospital, especially patients at high risk such as the elderly. This causes congestion in the hospital because chronic patients need to perform regular checkups. If the patient is outside the living area and needs an examination, the patient must perform a re-registration process as the patient information is not in contact with each other. Through the telehomecare system, patients can perform health screenings at home through a remote data innovation system. This innovation is observed to be practical and easy to use, while providing better access to health care without compromising on quality. The telehomecare framework may provide screening care to high-potential patients at home by means of CCTV, biometric sensors, vital sign monitors and other electronic devices. However, before telehomecare technology can be implemented, an understanding of the healthcare framework and the adoption of the technology among health workers and patients is important to investigate. The objective of the study is to compare and contrast existing Telehomecare models that can be used for the proposed framework through Telehomecare, explore existing nursing processes through primary data collection through case study, development of a proposed framework to integrate electronic medical records through Telehomecare and validate the proposed framework. The purpose of this research is to analyze and understand how to integrate the telehomecare system framework for seamless access to health records. Key data collection was done through field studies in several health service organizations throughout Malaysia. Data collected from case studies such as health workers awareness and barriers will be used as input to propose the THSystem framework to integrate home health records and medical records of health facilities in hospitals.

## **RANGKA KERJA BERSEPADU SISTEM *TELEHOMECARE* UNTUK CAPAIAN LANCAR REKOD KESIHATAN**

### **ABSTRAK**

*Jumlah pesakit yang menghadapi penyakit kronik semakin meningkat di setiap hospital terutamanya pesakit yang berisiko tinggi seperti orang tua. Ini menyebabkan kesesakan di hospital kerana pesakit kronik perlu melakukan pemeriksaan secara konsisten. Sekiranya pesakit berada di luar kawasan tempat tinggal dan memerlukan pemeriksaan, pesakit hendaklah melakukan proses pendaftaran semula kerana maklumat pesakit tidak berhubung antara satu sama lain. Melalui sistem 'telehomecare', pesakit dapat melakukan pemeriksaan kesihatan di rumah melalui sistem inovasi data secara jauh. Inovasi ini adalah praktikal dan mudah digunakan, sambil memberi akses yang lebih baik kepada penjagaan kesihatan tanpa mengabaikan kualiti. Rangka kerja bersepadu sistem 'telehomecare' memberi penjagaan pemeriksaan kepada pesakit yang berada di rumah dengan cara pemasangan televisyen litar tertutup, pengesan biometrik, alat kawalan kesihatan dan alatan elektronik yang lain. Walaubagaimanapun, sebelum sistem 'telehomecare' dapat dilaksanakan, pemahaman rangka kerja penjagaan kesihatan dan penerimaan teknologi di kalangan pekerja kesihatan dan pesakit adalah penting untuk dikaji. Objektif kajian adalah untuk membandingkan dan membezakan sistem 'telehomecare' yang sedia ada dan dapat digunakan untuk rangka kerja yang dicadangkan serta memahami proses kejururawatan melalui pengumpulan data penting. Tujuan penyelidikan ini adalah untuk menganalisis dan memahami bagaimana untuk mengintegrasikan rangka kerja bersepadu sistem 'telehomecare' untuk capaian lancar rekod kesihatan. Pengumpulan data-data penting dilakukan melalui kajian di beberapa organisasi perkhidmatan kesihatan di seluruh Malaysia. Data yang dikumpulkan dari kajian kes seperti kesedaran dan cabaran pekerja kesihatan dan pesakit akan digunakan sebagai input untuk mengintegrasikan rangka kerja bersepadu sistem 'telehomecare' untuk capaian lancar rekod kesihatan di hospital.*



## ACKNOWLEDGEMENTS

I would like to thank many people who have supported my research and thesis during this long journey. My first special thanks should go to my primary advisor, Prof. Dr. Mohd Khanapi bin Abd. Ghani. The completion of this thesis was only possible through her advice, support, encouragement and the continuous intellectual challenges that she thoughtfully offered throughout my Ph.D. studies. I would like to thank to my co-supervisor Associate Prof. Ts. Dr. Nurul Akmar binti Emran for her advice and guidance too.

I would also like to express my gratitude to three (3) company for my case study such as Johor Specialist Hospital, Home Nursing Providers Sdn Bhd and Nurses at Home Sdn Bhd. Thanks to the Malaysian Ministry of Higher Education for sponsoring my study.

I am grateful to my parents Zainal Abidin bin Sha'ari and Rapeah bintu Umor, who never tired of supporting me and giving me constructive criticism. Last but not least, thanks to my husband Mohd Fairuz bin Taib who supported me—and believed in me. Deep appreciations are also dedicated to anyone who directly or indirectly involved in this study

## TABLE OF CONTENTS

	PAGE
DECLARATION	i
APPROVAL	ii
DEDICATION	iii
RANGKA KERJA BERSEPADU SISTEM <i>TELEHOMECARE</i> UNTUK CAPAIAN LANCAR REKOD KESIHATAN	v
<i>ABSTRAK</i>	v
ACKNOWLEDGEMENTS	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	x
LIST OF FIGURES	xii
LIST OF APPENDICES	xiv
LIST OF ABBREVIATIONS	xv
LIST OF PUBLICATIONS	xvi
CHAPTER 1	1
INTRODUCTION	1
1.1 Overview	1
1.2 Research problem	2
1.3 Research aim	3
1.4 Research objective	3
1.5 Research question	5
1.6 Significance of the research	6
1.7 Summary of research	6
1.8 Organization of the report	8
CHAPTER 2	9
LITERATURE REVIEW	9
2.1 Introduction	9
2.2 Approach to do research	9
2.2.1 Identification	9
2.3 Telehomecare in mental primary studies	11
2.4 Telehomecare literature review for asthma	19
2.5 Telehomecare literature review for cancer	25
2.6 Telehomecare literature review for chronic kidney disease	35
2.7 Telehomecare literature review for diabetes	37
2.8 Telehomecare in general perspective	<b>Error! Bookmark not defined.</b>
2.9 Telehealth from a technology perspective	<b>Error! Bookmark not defined.</b>
2.10 Primary telemedicine and relationships to Telenursing	52
2.11 Strategy of telehomecare	53
2.12 Benefit of telehomecare	53
2.13 Background of healthcare status in Malaysia	54
2.13.1 General background	54
2.13.2 Overview of healthcare system	55
2.14 Background of chronic disease	57
2.14.1 Overview	57
2.14.2 Chronic disease in Europe	58

2.14.3	Chronic disease in South East Asia	59
2.14.4	Chronic disease in Malaysia	60
2.15	Malaysia's future healthcare system	61
2.15.1	Introduction	61
2.15.2	The importance of Telehomecare for Malaysia	61
2.16	Articles in Telehomecare	63
2.17	Approaches to and concepts of Telehomecare	65
2.18	Current Framework Healthcare in Malaysia	82
2.19	Summary	84
	CHAPTER 3	87
	METHODOLOGY	87
3.1	Overview	87
3.2	Research Methodology	87
3.3	Case Study	88
3.3.1	Background of the case study	89
3.4	Participants	99
3.5	Interviews	101
3.6	Questionnaire	107
3.7	Summary of Research Methods Used in this Research	109
3.7.1	Analysis of existing system	110
3.7.2	Design and development of conceptual framework	111
3.7.3	Validation of proposed framework	112
3.7.4	Revision of proposed framework	112
3.8	Summary	112
	CHAPTER 4	114
	PROPOSED THSystem FRAMEWORK	114
4.1	Introduction	114
4.2	Proposed conceptual framework	114
4.2.1	Framework overview	114
4.2.2	Architecture of the conceptual framework	115
4.3	Summary	128
	CHAPTER 5	130
	VALIDATION OF THE PROPOSED FRAMEWORK	130
5.1	Overview	130
5.2	Strategy of validation	131
5.3	Discussion of the case study validation	131
5.4	Validation THSystem framework	132
5.5	Validation approach for health worker	133
5.6	Results for THSystem framework	133
5.6.1	Overall who agree with THSystems	134
5.6.2	Feedback of THSystem use case and processes	134
5.7	Barriers of implementation	135
5.8	Benefits of implementation	139
5.9	Healthcare standards	141
5.10	Validation discussion for THSystem prototype	141
5.11	Results and discussion of prototype validation	141
5.12	Validation via IT subject matter experts	146
5.12.1	Overview background of respondents	147
5.12.2	IT expert	149

5.12.3 Doctors response	151
5.12.4 Nurses response	154
5.12.5 Manager response	156
5.12.6 Other IT industry expert response	159
5.12.7 Analysis of themes and subthemes from the validation phase	161
5.12.8 Cross case analysis for IT industry experts	161
5.13 Summary	165
CHAPTER 6	168
6.1 Introduction	168
6.2 Summary of the completed work	168
6.3 Contributions	170
6.4 Outcomes from research objectives	173
6.5 Constraints and limitations	174
6.5.1 Lacking access to other countries' regarding Telehomecare	174
6.5.2 Involving with private and confidential information	174
6.5.3 Understanding complexity of the healthcare system	175
6.6 Further research	175
REFERENCES	176



## LIST OF TABLES

<b>TABLE</b>	<b>TITLE</b>	<b>PAGE</b>
1.1	Summary of Research	6
2.1	Inclusion criteria for systematic review	11
2.2	Literature review for Telehomecare in mental primary studies	12
2.3	Literature review for Telehomecare of asthma	20
2.4	Literature review for Telehomecare of cancer	27
2.5	Literature review for chronic kidney disease	37
2.6	Telehomecare literature review for diabetes	38
2.7	CITL taxanomy and maturity model for Telehealth	51
2.8	Quality of life indicator 2006-2010	56
2.9	Literature review	67
3.1	Breakdown of participants involved in this study	103
4.1	Security requirement	127
4.2	Privacy requirement	128
4.3	Patient health record data: common formats and sources	131
5.1	Category of the respondents	137
5.2	Comments on technology	139
5.3	Summary benefits of implementation	143
5.4	Likert scale measurement	145

5.5	Questions used to measure the effectiveness of the system	145
5.6	Overview of IT subject matter experts	151
5.7	IT expert response	153
5.8	Doctors response	155
5.9	Nurses response	158
5.10	Manager response	160
5.11	Other IT industry expert response	163
5.12	Percentage of IT experts who rated agree or strongly agree	165
5.13	Summary of applicable themes highlighted by IT experts	167
6.1	Outcomes from research objectives	176



## LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	Telehealth	54
2.2	Personal health care	57
2.3	Schematic overview of the health system	57
2.4	Admissions and outpatient attendances	58
2.5	Deaths by cause, WHO region for South-East Asia 2005	61
2.6	Deaths by cause, WHO region for Malaysia 2002	62
3.1	The percentage of the diseases of patient	100
3.2	The percentage of patient who used computer	100
3.3	The percentage of patient who used internet	101
3.4	Patient who had heard about the Telehomecare	101
3.5	Health workers who had involved in questionnaire	107
3.6	Health workers who used computer	108
3.7	Health workers who used internet	108
3.8	Analysis of the technology acceptance of Telehomecare system	109
3.9	The percentage of the diseases of patient	110
3.10	The percentage of patient who used computer	111
3.11	The percentage of patient who used internet	111
3.12	Patient who had heard about the Telehomecare	112

3.13	Summary of research methodology	113
4.1	Conceptual framework of THSystem	118
4.2	Process of support care	123
4.3	Overall process of THsystem	124
4.4	Details process of THsystem	124
4.5	The structure of the portable Telehomecare monitoring system	128
4.6	Current technology of Telehomecare	130
5.1	Validation check	135
5.2	Validation method for THsystem framework	136
5.3	Respondents who agree with THsystems	138
5.4	Feedback of THsystem use cases and process	138
5.5	Feedback about willing to implement THsystem framework	142
5.6	Results question 1	146
5.7	Results question 2	147
5.8	Results question 3	147
5.9	Respondents feedback for question 4	148
5.10	Respondents feedback for question 5	149
5.11	IT expert response	152
5.12	Doctors response	154
5.13	HIS academic expert response	157
5.14	Non health information systems	159
5.15	Other IT industry expert response	162
5.16	Percentage of IT Experts who rate agree or strongly agree	164



## LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Borang kaji selidik (survey forms) - patients	203
B	Borang kaji selidik (survey forms) – health workers	211
C	Validation of THsystem framework	218
D	Minit mesyuarat penyelidikan bersama Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam – Smart chair for Telehomecare – bil 1/2015	224
E	Minit mesyuarat penyelidikan bersama Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam – Smart chair for Telehomecare – bil 1/2014	227
F	Minit mesyuarat penyelidikan bersama Politeknik Sultan Salahuddin Abdul Aziz Shah, Shah Alam – Smart chair for Telehomecare – bil 1/2013	231
G	Letter permission to conduct questionnaire at KPJ Johor Specialist hospital	235
H	Letter discussion within KPJ and UTeM	236
I	Interview	237
J	Pictures during case study	240

## LIST OF ABBREVIATIONS

CDSSs	-	Computerized decision support systems
CIS	-	Clinical information systems
EHR	-	Electronic health records
HIS	-	Hospital information systems
HL7	-	Health level seven international
I.C.D.-10	-	International statistical classification of diseases and related health problems 10th revision
IC	-	Identification card
IHIS	-	Integration of health information systems
ISA	-	Information systems architecture
ISO	-	International standards organization
IT	-	Information technology
LHR	-	Lifetime health record
MPI	-	Maintain health records
N.H.S.	-	National health service, United Kingdom
N.M.D.S.	-	National minimum dataset, New Zealand
RHR	-	Retrieve health records
S.O.A.P.	-	Subjective objective assessment plan
UNFPA	-	United nations population fund
UNICEF	-	The United nations children's fund
W.H.O.	-	World health organization

## LIST OF PUBLICATIONS

### Journal

1. Nor Afirdaus (2020). A conceptual integrated health information systems framework in postnatal care for modern and traditional malay medicine, *Indonesian Journal of Electrical Engineering and Computer Science*, Vol. 17, No. 3, pp. 1531-1539. [Online] DOI: <http://doi.org/10.11591/ijeecs.v17.i3.pp1531-1539> (Accessed: March 2020).

### Book Chapter

1. Nor Afirdaus (2017). 'An Overview of Nursing Home Care and Proposed Implementation of E-HealthCare: A Case Study' in Mohd Khanapi, Raja Rina. *Health Informatics Research: Case Study and Applications*. Melaka: Universiti Teknikal Malaysia, pp 51- 60.

### Attended Conferences

1. Nor Afirdaus, Mohd Khanapi (2017). Acceptance of Telehomecare System Among Health Workers in Malaysia. *The 6th International Conference on Computer Science and Computational Mathematics 2017 (ICCSCM 2017)*, Langkawi, 4-5 May.
2. Nor Afirdaus (2016). Public perceptions of telehomecare system for the elderly. *SEAMOLEC-AIC Indonesia*, Jakarta, 17 February.

3. Nor Afirdaus, Mohd Khanapi (2015). An Overview of Telehomecare. *The International Conference on Electrical and Electronic Engineering 2015 (IC3E 2015)*, Melaka, 10-11 August.
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5. Nor Afirdaus, Mohd Khanapi (2013). A Framework for Gathering Electronic Medical Record through Telehomecare. *e-Proceeding of Software Engineering Postgraduates Workshop (SEPoW) 2013, Melaka, 19 November.*



# CHAPTER 1

## INTRODUCTION

### 1.1 Overview

Telehomecare and the more extensive field of telehealth keeps on picking up noticeable quality and backing. A considerable measure of cash has been designated by elected governments to advance telehealth activities as showed by the numerous pilot undertakings and projects that have been set up.

The significance of extending homecare and supporting casual parental figures has moreover been given solid bolster. The potential for telehealth to address a portion of the issues identified with the extension of homecare has not gone unnoticed. This report looks at the cover amongst telehealth and homecare with an exceptional spotlight on the effect of telehomecare on casual caregivers. Casual parental figures give unpaid consideration to delicate, constantly sick or handicapped people.

Also, casual guardians are not legitimately perceived by the locale through licensure, affirmation or enrollment. Casual parental figures are predominately family individuals yet may likewise incorporate companions or neighbors and volunteers. Casual consideration is not synonymous with homecare, however there is an impressive cover. Most casual consideration is given in the home, however can likewise be given in institutional settings, for example, healing centers and nursing homes.

Homecare can be given by formal social insurance experts or bolster work force, in expansion to casual parental figures Homecare involves four fundamental sorts of

consideration: intense consideration, perpetual or proceeding with consideration, promotive or preventive consideration and palliative consideration (Aaron M. Clay et. al., 2016).

## 1.2 Research problem

The first research problem is no continuity and seamlessness of patients' health record. Medical record stored in different location and fragmented. For example, Hospital A is using XY Information System, Hospital B is using Hospital ZZ Information System. Patient A have registered at Hospital A in 2018 due of diabetes problem. The patient records stored in the XY Information System. In 2019, patient went to Hospital B and the patient need to do the registration again and the patient information not stored in Hospital ZZ Information System. Computerized information systems are being installed in government hospitals 14 out of 138 in 2010 and in government dental clinics. No information is available on IT use in the private sector. Patients' health record cannot be share within public and private hospital if information not be digitalizing in both hospitals. Implementation in development of information communication technology in the health sector is slow given the huge investment required in infrastructure, lack of informatics expertise and the need to make informatics relevant to local needs and capacities. There are also technical difficulties with lack of compatibility between ICT programmes and interoperability barriers. For example, interoperability challenges for Teleprimary Care include coding health care data for uniform entry and transfer, safeguarding data security and integrity and protecting patient confidentiality.

The second research problem is patients' health record contents stored manually. In 2019, currently, only 20% included Selayang Hospital and Ampang Hospital, but it is still not fully operational that already have the system in place in Malaysia (The Star, Tuesday 19 Mar 2019). Others hospital still stored manually patients' health records. According to

the myhealth regarding medical records contents there are currently 143 hospitals under the Ministry of health. This amount includes a total of 127 manual management hospitals (88%) and 16 or (12%) of IT hospital. Manual management means the hospitals still need and use physical care medical records in the treatments of patients and apply IT in a minimum in the daily tasks. The main issue faced by these hospitals is the lack of patient medical records storage space. Patients' medical records must be kept for 7 years from the end date of the patient's treatment only then it can be disposed. Except for Pediatric Medical records and Obstetrics storage period are about 21 years, while for mental patients the records are disposed after 3 years from the date of death of the patient.

### **1.3 Research aim**

To produce a framework for integrating medical record between Telehomecare system and Health system that enables data to be shared among healthcare industry.

### **1.4 Research objective**

The successful introduction of Telehomecare with tangible outputs requires in depth understanding of the existing health care system of the country and its challenges, strongly expressed 'genuine need' for the service by the all the domains (patients, health workers, organization and the public), the actual status of ICT infrastructure in the country and costs. Rigorous research should be carried out with an appropriate methodology before implementing new systems which all contribute towards sustainability of the project. In current framework plan for Malaysia (The Eleventh Malaysia Plan 2016–2020) have announce that one of the objectives is to improve access and equity in delivering health-care services and improved responsiveness of the health-care system, including aspects of meeting technical standards. To achive this current framework, so this research is to fulfill the following objectives:

#### **1.4.1 Compare the existing Telehomecare model that can be used for proposed framework through Telehomecare**

The first objective in this research is for analyzing and comparing existing framework for gathering patient medical record through Telehomecare. Aim of this objective is to develop a propose framework in gathering patient data in a different way and to review the current status of framework in Malaysia.

#### **1.4.2 Explore the existing of nursing process through primary data collection via case study field**

The second objective is to do case studies of nursing process in public and private hospitals. It will help to provide a way to share knowledge and gain more information on their experiences. At the end of this level, clinical patient data should be identified and defined to help gathering patient medical record and to proposed framework. It will help to examine the imperatives, ideal conditions, history, and challenges related to effective outcome measurement in nursing.

#### **1.4.3 Development of propose framework for integrating electronic medical record through Telehomecare**

This objective is to develop a propose framework that achieves research objective. At this level the basic development of system has been identified and constructed. Collaboration with the hospital is required to perform the validation. Any deficiencies in the identification of appropriate techniques and consequently to improve work processes.