Faculty of Information and Communication Technology

A FRAMEWORK FOR ACCESSING PATIENT HEALTH RECORDS USING INFORMATION COMMUNICATION TECHNOLOGY DEVICES

Noorayisahbe Binti Mohd Yaacob

Master of Science in Information and Communication Technology

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A FRAMEWORK FOR ACCESSING PATIENT HEALTH RECORDS USING INFORMATION COMMUNICATION TECHNOLOGY DEVICES

NOORAYISAHBE BINTI MOHD YAACOB

A thesis submitted
in fulfillment of the requirements for the degree of Master of Science
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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2016

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DECLARATION

I declare that this thesis entitle "A Framework for Accessing Patient Health Records using Information Communication Technology Devices" 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.

Signature : ……

Name : Noorayisahbe Binti Mohd Yaacob

Date : 16 October 2016

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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 Master of Science in Information and Communication Technology.

Signature : ……

Supervisor Name : Assoc. Prof. Dr Mohd Khanapi Abd Ghani

Date : 16 October 2016

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DEDICATION

To my beloved father Mohd Yaacob bin Abdul Hamid and my mother Norjahan Bibi binti Mohd Shariff and also my siblings. To everyone help me to completed this thesis and with me along this journey.

To those involved in the medical fraternity, discerning colleagues in the related field and above to all the stakeholders especially the patients, doctors, administrators and nurses in the ever evolving, challenging and dynamic medical field.

Essentially, to expedite and simplify the accessibility to the patients' healthcare records.

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ABSTRACT

Health is an important aspect of life's well-being. Thus, it is important that the provision of healthcare is allowed and make it easy for patient to access their respective personal health records at any time and at anywhere. Electronic personal health record (e-PHR) can be defined as one of the important role in management of human life which provide patient to access and manage their medical at any time and at anywhere. However, a few gaps have been identified in the patient self-management. The first gap is the crucial personalize health records (PHR) attributed to be viewed by the patient. The second gap is the data integrity patient privilege-which meant provide the ability for the patient to delete information from the e-PHR or withhold the communication of certain information. Nevertheless, this capability is built into most e-PHRs by having this privilege-made personalized information not valid and leading to data manipulation. The aim of this research is to solve problem in patient self-management of e-PHR by capturing some limitations which are crucial PHR attributes and data integrity of PHR. The processes of this research started by identify the crucial dataset represent PHR attribute via surveys and interviews with medical experts to understand the crucial PHR attribute. Subsequently, by perform a comparison of current and previous studies on healthcare system architecture. The data collection of this research was done through several approaches via interviews, online surveys, questionnaires, literature reviews and observations. The primary data were collected using semi-structured and open-ended interviews and were combined with observations and analyses of the organization's documents. Meanwhile, secondary data were gathered from the literature review and organization documents that formed the theoretical and initial proposed framework. Finally, as a result, the design of conceptual and deployment model of proposed framework was produced and a prototype system (e-PHR) was developed to validate the proposed framework. The validation of this research consisted two parts which are validation of proposed framework architecture from software aspect and validation through user satisfaction aspect. The validation of the proposed framework architecture was done through interviews on few important criterions with the software expert from two companies based in Malacca. The result of validation of architecture for proposed framework part is precise. While, for the viability aspect was flexible and enabled the personal health record to be accessed anytime and anywhere by the patient through the multi devices and can be kept into storage devices. The implementation aspect was supported and recommended to be implemented not in UTeM but also in the entire private or government Health Centers in Malaysia. Additionally, the validation from the user satisfaction measured from few important aspects through surveys conducted at UTeM the target users is the UTeM staff including UTeM student in different faculties. As a result, 87.6% users agreed of the system capabilities. 83.2% users agreed with overall performance expectancy. 86.7% users agreed and were satisfied to use this system. In conclusion, this research was conducted through case study approach at the

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UTeM Health Centre. The findings and validation showed that this framework is suitable to be implemented especially in Malaysia. Besides that, these research outcome have provide improvement and benefits in the field of electronic personalize health records where patient as user's are able to access and manage their own personal health records by themselves through the proposed framework via multi devices such smart phones, tablets, personal computers and laptops as well as to keep in local, cloud and centralized storages.

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ABSTRAK

Kesihatan adalah satu aspek penting dalam kesejahteraan kehidupan. Oleh itu, adalah penting penyediaan penjagaan kesihatan dimana kemudahan akses kepada rekod kesihatan pesakit seperti data kesihatan peribadi elektronik yang boleh di akses dari mana-mana sahaja pada bila – bila masa. Rekod kesihatan peribadi elektronik (e-PHR) boleh ditakrifkan sebagai salah satu peranan penting dalam kehidupan manusia dan memberi kebenaran kepada pesakit untuk mengakses dan menguruskan rekod perubatan mereka di mana sahaja pada bila-bila masa. Walau bagaimanapun, beberapa kekangan telah dikenal pasti dalam aspek pengurusan pesakit melalui diri sendiri. Kekangan pertama adalah rekod kesihatan peribadi penting (PHR) yang atribut dapat dilihat oleh pesakit dan kekangan kedua adalah integriti data sebagai keistimewaan pesakit, iaitu keupayaan untuk memadam maklumat daripada e-PHR atau menahan penyampaian maklumat tertentu. Walau bagaimanapun, keupayaan ini dibina ke dalam kebanyakan e-PHRs dengan mempunyai keistimewaan ini dibuat maklumat peribadi tidak sah dan membawa kepada aspek manipulasi data. Tujuan kajian ini adalah untuk menyelesaikan masalah dari segi pengurusan oleh pesakit itu sendiri melalui e-PHR yang telah dikenal pasti terdapat beberapa batasan yang amat penting dalam PHR atribut dan integriti data PHR. Proses kajian ini telah dimulakan dengan mengenal pasti set data atribut PHR yang penting melalui kaji selidik dan temu bual dengan pakar perubatan untuk memahami set data atribut PHR semasa yang amat penting. Kemudian, dengan melakukan kajian perbandingan terhadap kajian semasa dan sebelum pada seni bina sistem penjagaan kesihatan. Pengumpulan data kajian ini telah dilakukan melalui beberapa pendekatan melalui temu bual, kaji selidik dalam talian, soal selidik, kajian literatur dan pemerhatian. Data primer (data utama) telah dikumpulkan menggunakan temu bual separa berstruktur dan terbuka dan telah digabungkan dengan pemerhatian dan analisis dokumen organisasi. Sementara itu, data sekunder dikumpulkan dari kajian literatur dan organisasi dokumen-dokumen yang telah membentuk rangka kerja yang dicadangkan teori dan awal. Selepas itu, hasilnya, reka bentuk model konsep rangka kerja telah dihasilkan dan sistem prototaip (e-PHR) telah dibangunkan untuk mengesahkan rangka kerja yang dicadangkan. Tambahan pula, pengesahan kajian ini terdiri daripada 2 bahagian iaitu pengesahan seni bina rangka kerja dari aspek perisian dan pengesahan melalui aspek kepuasan pengguna. Pengesahan rangka seni bina yang dicadangkan telah dilakukan melalui temu bual itu berdasarkan beberapa kriteria penting dengan pakar perisian dari dua syarikat yang stabil di Melaka. Hasil dari pengesahan rangka seni bina yang dicadangkan adalah ringkas dan tepat. Manakala, untuk aspek kebolehlaksanaan adalah fleksibel dan membolehkan rekod kesihatan peribadi diakses pada bila-bila masa dan di mana sahaja oleh pesakit melalui pelbagai peranti dan boleh menyimpan ke dalam peranti storan. Aspek perlaksanaan telah disokong dan disyorkan untuk meneruskan pelaksanaan di UTeM dan pusat kesihatan swasta atau kerajaan di dalam Malaysia. Selain itu, pengesahan dari kepuasan pengguna itu

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telah diukur dari beberapa aspek penting melalui kaji selidik di UTeM sasaran responden adalah kakitangan UTeM termasuk pelajar UTeM di fakulti yang berbeza. Hasil dari pengesahan ini dari segi bahagian keupayaan sistem adalah kira-kira 87.6% bersetuju dengan keupayaan sistem, prestasi jangka adalah kira-kira 83.2% bersetuju dengan keseluruhan aspek prestasi dan kira-kira 86.7% bersetuju dan berpuas hati dengan sistem ini. Kesimpulannya, kajian penyelidik ini telah dijalankan melalui kes pendekatan kajian di Pusat Kesihatan UTeM. Penemuan daripada pengumpulan data dan pengesahan telah menunjukkan bahawa rangka kerja ini adalah sesuai untuk diimplemenkan terutama di peringkat Malaysia. Selain itu, ini hasil penyelidikan telah membuat penambahbaikan dan memberi manfaat dalam bidang rekod peribadi kesihatan elektronik, dimana pesakit sebagi pengguna boleh mengakses dan mengurus rekod kesihatan peribadi pesakit mereka oleh mereka sendiri melalui pelbagai peranti seperti telefon pintar, table, komputer peribadi dan komputer riba pada bila –bila masa dan di mana- mana sahaja dan menyimpan di dalam peranti storan seperti peranti storan setempat, peranti simpanan awan dan peranti storan berpusat.

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LIST OF ABBREVIATIONS

e-PHR	-	Electronic Personalized Health Records
e-CSS	-	Electronic Clinical Support System
EHR	-	Electronic Health Records
PEHR	-	Personalized Electronic Health Record
LHR	-	Lifetime Health Records
PCEHR	-	Personalized Health Records
HIS	-	Hospital Information System
SOP	-	standard operating procedures
EMR	-	Electronic Medical Record
UTeM	-	Universiti Teknikal Malaysia Melaka
PAS	-	Patient Administration System
HRMIS	-	Human Resource Management Information System
SRs	-	Systematic Review
SPSS	-	Statistical Package for the Social Sciences
Drs	-	Doctors
MAs	-	Medical Assistants
PI	-	Patient Information
MH	-	Medical History
LoA	-	List of Allergy
VSD	-	Vital Sign Data
LoM	-	List of Medication
FMH	-	Family Medical History
PMI	-	Patient Medical Identification Number
HL 7	-	Health Level Seven International
OSI	-	Open Systems Interconnection

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DSTU	-	Draft Standards for Trial Use
RMI	-	Remote Method Invocation
RPC	-	Remote Procedure Call
BLG	-	Blood Glucose
BMI	-	Body Mass Index
BP	-	Blood Pressure
WHO	-	World Health Organization
WTO	-	World Trade Organization
ICT	-	Information and Communication Technology
HIMS	-	Health Information Management System
IDE	-	Integrated Development Environment
SDK	-	Software Development Kit
ADT	-	Android Developer Tools
IT	-	Information Technology
MOH	-	Ministry Of Health
FFeF	-	Flexible Front-end Framework
POMR	-	Problem-Oriented Medical Record

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A Framework for Accessing Patient Health Records through Multi Channel of Devices. NM Yaacob, MKA Ghani, ASH Basari - e-Proceeding of Software Engineering Postgraduates, 2013

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