

Clinic Panel Information System: Case Study Of International Students In Universiti Utara Malaysia

Mohammed Jaber Farhan¹, Sinan Adnan Muhisn¹, Nassir Jabir Al-khafaji² and Zahraa Abed Aljasim Muhisn³

¹Universiti Utara Malaysia, Kedah, Malaysia

²Technical Institute, Thi-Qar, Iraq

³Al-Qasim Green University, Babylon, Iraq

Abstract—Health service is one of the important services offered by universities to international students. It is considered a significant measure that indicates the universities' interest in the welfare of this segment of students. However, obstacles related to health service negatively affect students, and one of these obstacles is the requirement to present health insurance documents. Generally, hospitals require students to show proof of health insurance prior to treatment. This requirement is a challenge for students especially in emergency cases, and it also delays the therapy or surgery. In response to this issue, this paper aims to develop a prototype of clinic panel information system that allows online access to student information, including their insurance details, and sends e-mail notifications to students when their insurance is about to expire. Rapid application development methodology is used in research design, and system usability scale was used to evaluate the usability. The prototype was assessed through a sample that consists of thirty-six respondents and was found to produce positive results.

Keywords—insurance health, clinic panel, international student, notification, information and communication technology

INTRODUCTION

Information and communication technology (ICT) is a general term used to refer to computer hardware, software, and networks (Yousefi, 2011). ICT also provides computer personnel with guidelines for system maintenance. Hence, technological usage and organizational and strategic aspects of information systems should be given consideration (Schubert & Leimstoll, 2006). Widespread ICT use in health systems has implications for different individuals involved in the health-disease process and the process of providing care to communities. This context must be considered from different perspectives: patients, health professionals, and health organizations.

The majority of developed countries are exploring different health care processes, a new perspective on managing information and enabling the use of data for health research to improve patient care has emerged. In this new health care setting, health care

professionals, particularly nurses, are well placed to call for specific education and training to enable them to respond to the new challenges brought about by changes in health care practices (Díaz, Galimany, Estrada & Blanca, 2013). Masclans, Roger, and Pegueroles (2011) add that such changes involve a process of adaptation for health care professionals. Incorporation and implementation of ICT in the health sector also involves a process of adaptation for patients, users, and health institutions. To make them usable for clinical management and maintaining health records are commonly considered IT activities. The use of IT in maintaining health records ensures that professionals can perform their work more efficiently. In such tasks, individual health personnel are allowed to access personal health information of patients, share it, and coordinate as needed. According to Moreno, Peterson, Bagchi, and Af-Ursin (2007), health-related information such as demographic details, health insurance information, and history of medications and allergies play important roles in medical diagnosis and therapy. Updated information can facilitate continuous research and development in the field of public health care delivery.

The recent evolution of ICT in the financial services industry is changing the pace of extending insurance services. ICT offer tools to provide new savings and improve customerservice. Unfortunately, the insurance industry faces strategic challenges in utilizing the web (Odoyo & Nyangosi, 2011). Companies hesitate to approve policies online and online facilities are slowly being added to some sites. With this trend, purchasing some types of insurance online remains a slow process. Evidently, issuance of insurance and other services, such as processing of claims and liabilities, needs to be conducted more quickly. Given the slow pace of some services, many insurance companies are left with the option to adopt and integrate ICT in their operations to improve service delivery. As a matter of fact, Apampa (2010) stated that insurance companies are now including ICT as part of their business infrastructure because ICT enables them to achieve their business goals quickly. However, companies should formulate appropriate strategic policies to enhance the strategic positioning of ICT, which is said to be a reliable solution to problems that hinder effective service delivery.

To address the slow delivery of services, the general consensus is that the sector should have implemented web services earlier. Given that ICT in health care insurance companies is still in the experimental phase and that some companies are still thinking about adopting web technologies (Bakker & Iacob, 2009), it is unsurprising that the sector has yet to achieve its expected goals. A suggestion is for research to be conducted on web service implementations on an enterprise-wide scale to improve output.

Generally, hospitals require students to show proof of health insurance before they receive treatment. This requirement is especially challenging for students who are dealing with emergency cases. This study aims to build a prototype for a clinic panel information system (CPIS) to ensure that Universiti Utara Malaysia (UUM) students receive timely diagnosis and treatment as well as to reduce any potential health risks to patients.

Problem Statement

Different types of medical information management systems are currently being used in the health sector. Information systems are also used by health care organizations to support their operations (Lewis, Hodge, Gamage, & Whittaker, 2012). Tasks such as clinical management and electronic medical record keeping necessitate service integration. Alawneh, El-Sheikh, and Kanaan (2011) pointed out that transactions between insurance companies and their clients are entirely paper based. The web sites of the majority of insurers are mainly corporate oriented and not geared toward customers (Mubaraka, Momanyi & Jibia, 2013). As previously stated, students are required to present proof of insurance, which they may not have on hand, before receiving medical care. Blumenthal (2009) and Ammenwerth and Spötl (2009) stated that other documents, such as documentation for quality management, are often rejected by hospitals for legal reasons, even though such documents are indirectly involved in the patients' documentation.

According to a September 7, 2013 interview with insurance company of UUM, the international students can present an insurance card and a photocopy of their insurance papers. Alternatively, the hospital can call the student's insurer to prove that he or she has insurance and can obtain the company's approval to

proceed with the treatment. However, many health care experts pointed out that a digitized information system is important to the improvement of healthcare. Preparing paper documents is time consuming, which can endanger patients' lives because health service is not promptly delivered and it reduces the quality of health care. In addition, Louca (2012) stated that professionals spend a lot of time on administrative documentation tasks. Health care can also be improved by exploring a strategic relationship among different disciplines and entities such as clinicians and insurance companies.

As stated above, current processes can negatively affect the health of patients. According to an interview on September 8, 2013 at the UUM clinic, the quality of service and the health of patients can be improved with the use of electronic panels that health care professionals can use to view and check whether a student's insurance covers his or her treatment, especially for emergency cases. Thus, this study aims to address the need to improve health care by developing a prototype CPIS that connects a student, the clinic, and the insurance company. This prototype is being developed under the supervision of the university to facilitate medical services for international students in UUM.

The project is geared toward international students in UUM and clinics and hospitals covered by these students' insurance plans. The aim of this study is to provide international students with better health services. The proposed CPIS can offer the following services: it provides clinics or hospitals and insurance companies with a facility that allows them to exchange information about a student, which is useful in emergency cases. The CPIS can also identify the clinics and hospitals that are covered by an insurance plan, thereby allowing students to choose the right hospitals where they can undergo treatment. Through the system, students can check international student insurance balance and verify if they will need to produce proof of insurance prior to getting treatment. This feature ensures that no time is wasted checking insurance documents or verifying with an insurance company if a student is indeed covered by their plan. Finally, the CPIS sends an automatic renewal notice to students one week before their plan expires, thereby ensuring that they will renew their insurance plan.

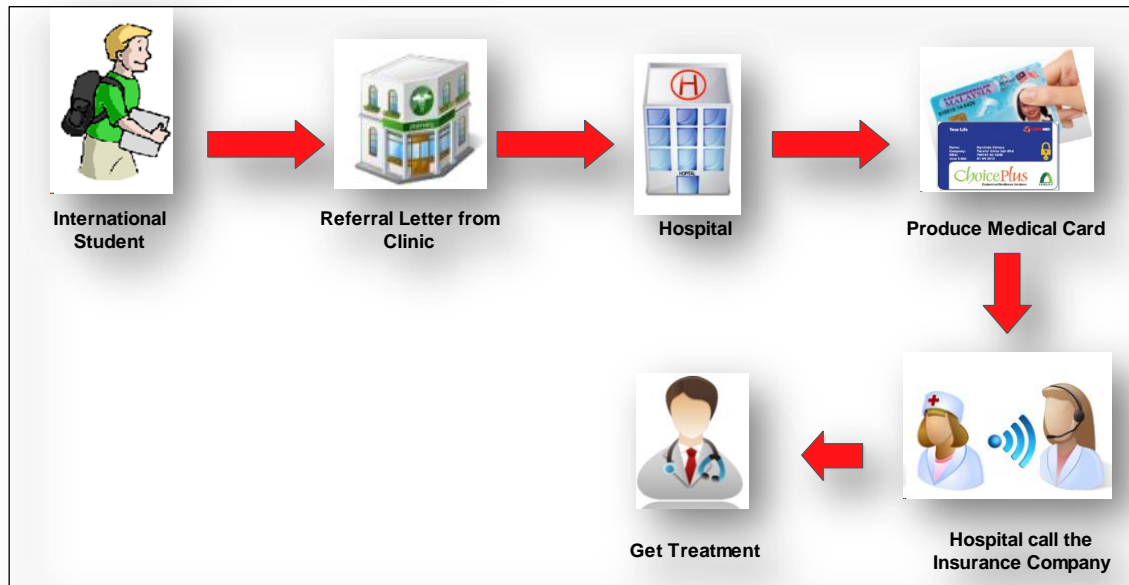


Figure 1: Student Treatment Process.

LITERATURE REVIEW

E-health

As an emerging field, e-health was brought about through interdisciplinary connection among medical informatics, public health, and business (Eysenbach, 2001). E-health is defined as health-related services and information delivered with the aid of the Internet and its associated technologies (Fardoun, Alghazzawi&Ciprés, 2012). Furthermore, the term explains the involved characteristics in terms of both technical development and concepts. The last few years have seen an increase in the number of standalone systems that are used for-health information management. As a result, large amount of information has accumulated, which hinders effective sharing and communication of the available information. Information sharing is considered the primary function of e-health. Other complex steps

further expand the meaning of “sharing” in the context of information sharing by using standalone systems.

Dinevski and Poli (2009) pointed that the key challenges in e-health are the following: integration and interoperability of the e-health information systems. To integrate is to ensure that all the systems have the capacity to communicate and share data with one another. Thus, integration is expected to be done through standard protocols and interfaces. Systems should be interoperable, that is, systems should be able to communicate with one another with utmost cooperation and profitability. Examples of ICT investments can be seen in the health sector. Table 1 describes the benefits for the types of initiatives (Lewis, Hodge, Gamage, & Whittaker, 2012). Table 1 is not a comprehensive list. Nevertheless, this table covers a wide range of investment types that can be employed in health ICT.

Table 1: ICT Investments in Health.

| Investment | Benefit | Investment | Benefit |
|--|--|--|---|
| Electronic decision support on drug ordering | Decreased drugcost and decreased risk of adverse effectscaused by drug–drug interaction | Coordinated care shared electronic health record | Decreased duplication of diagnostic tests. Enables immediate treatment of emerging health problems and reduces days of hospitalization |
| Hospital patient administration system (PAS) | Permits the management of hospital bed use and contributes to the analysis of the negative effect of disease and health system costs | Simple telemedicine case conferencing | Allows medical consultation with specialists at the local level.Possibly decrease the need for transferring patientsto other facilities |
| Web-based entry and reporting of routine health information at sub-national levels | Eliminates data duplicates and enables analysis of local reports in a more timely manner | Mobile phone notification of disease outbreaks | Prompter and more complete disease occurrence notification |

Insurance

Insurance has many definitions. However, generally, *insurance* can be defined as a method of protecting persons, families, and business groups against the financial losses by sharing the risks among a large group, which agrees to divide the financial losses in return of paying a premium. Insurance aims to provide financial stability to individuals, organizations, and businesses (Sanayei, Torkestani & Ahadi, 2012; Alam, Salim & Shah, 2010). According to Alipour, Dorodi, and Pishgahi (2011), insurance is an agreement in which for a stipulated payment (i.e., premium), the insurer agrees to pay the policyholder or designated beneficiary a certain amount (claim payment) when loss occurs.

E-Insurance

Circumstances and actions of businesses incessantly shift every day, and more options are delivered to businesses. In recent years, given the quick development of ICT and the expansion of the Internet, the trend of this disparity became faster. Electronic services encounter many disputes concerning their implementation and their effect on businesses (Hiwarkar & Khot, 2013). Currently, IT is being used by insurance companies to communicate with clients and brokers. Amirshahi and Karimian (2006) stated that these companies utilize IT to design insurance processes and policies, analyze the market, predict sales, fix premiums, and manage accounting procedures.

E-insurance is the Internet application and IT that deals with the production and distribution of insurance services (Alipour, Dorodi & Pishgahi, 2011). However, the legislation of insurance worldwide is continuously modified to accommodate online payment and delivery of policies. In summary, ICT has allowed significant changes in the insurance sector, thus changing the mode of operation and allowing significant enrichment of the range of services to end users (Coviello, 2012). In addition, according to Mubarak, Momanyi, and Jibia (2013), majority of insurers continue to build Internet websites that are structured on a corporate orientation rather than on customer needs.

Web-Based Applications

Auger (2004) defined web application as "a software application, executed by a web server, which responds to dynamic web page requests over Hypertext Transfer Protocol (HTTP)." According to Yao (2008), web technology has several advantages, including distributed infrastructure for information processing, prompt delivery, secure information and user-friendly tools, and no time or geographic restrictions. Thus, web technology enables users to access information anytime and anywhere. Ziemer (2002) argued that users prefer web applications over traditional applications because of the following reasons: (1) accessibility of web applications and (2)

low maintenance and deployment cost of web applications. Web applications have become accessible because of its availability on several platforms, including web browsers. Web applications run in web browsers. Therefore, installing a client software in each computer is no longer necessary. Code modifications can only be executed on a web server with web applications. Therefore, web applications guarantee the reduction in cost and time compared with traditional client/server applications.

Web Architecture

Adopting suitable web architecture is important before designing a web application. Redesigning a web application after development will incur more cost, time, and effort. As shown in Figure 1, the architecture of web application is divided into three tiers (Liu, Heo, & Sha, 2005): (1) web server, (2) application server, (3) and database server. Client requests are received by the web server, which is also known as presentation tier. Simultaneously, a complex dynamic content request is forwarded to the application server. Responses from the application server are then collected by the web server, and the web server sends back these responses to the clients. Internet Information Services (IIS) and Apache are examples of web servers. Requests from the web server are obtained by the application server, which is also known as the logic tier. Subsequently, the application server finds information in the database and processes this information. The processed information, which has been formatted for display in the client's machine, is returned to the web server. Apache Tomcat, Sun Java System Application Server, BEA WebLogic, IBM WebSphere, and JBOSS are common examples of application servers. The database server is also known as the data tier. All web site information, including user accounts, customer orders, and reports, is stored in the database server. Oracle, Microsoft SQL Server, Sybase, IBM DB2, MySQL, and PostgreSQL are examples of database servers.

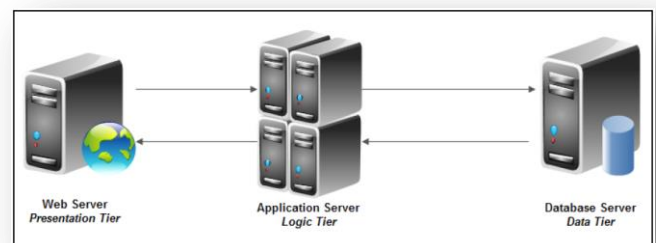


Figure 2: Three-tier Architecture.

Notification

Nowadays, the Internet is a necessary component to allow communication between organizations (Wirtz, Schilke & Ullrich, 2010). A notification service alerts a large number of recipients to attend to

important or emergency events. In addition, prompt notification using multiple modes is critical to handle a disaster (Li, Mallows & Landwehr, 2012). Mohamed, Al-Jaroodi, and Jawhar (2008) mentioned that different notification systems, such as telemedicine applications, accrual failure detectors, and e-commerce applications, are used for different domains and applications. For patients, communicating with their doctor, healthcare provider, or family member via e-mail notifications in a timely manner is an essential service (Álamo, Sarkar & Wong, 2008). According to Das and Kratz (2012), one possible way of risk management for an insurance company is to develop an early and appropriate notification system.

SMS Technology

The short message service (SMS) can be defined as "a globally accepted wireless service that enables the transmission of alphanumeric messages between mobile subscribers and external systems such as electronic mail, paging, and voice mail systems" (NewNet, 1999). Given the fast growth in mobile communication, SMS has become a widely used tool in business and social messaging because SMS offers fast and inexpensive technology. Mobile phones and external systems can transmit up to 1120 bits of alphanumeric messages (Agoyi & Seral, 2010). SMS has several advantages, including delivering of notifications and alerts, guaranteed message delivery, reliable and low-cost communication, and message screening (Amor, 2002). In addition, SMS is simple, easy to use, extensive in coverage, and can reach citizens anywhere and anytime (Wangpipatwong, Chutimaskul, & Papasratorn, 2005). SMS is a simple technology. Therefore, people can easily understand the mechanism of sending and receiving messages (see Figure 2). The sender mobile station sends a message. The message then goes through the base station (BS), which provides the radio infrastructure for wireless communications. BS then sends the message to the mobile switching center, which routes and switches all traffic into and out of the cellular system. The message is then sent to the SMS center, which is a centralized store-and-forward server that in turn accepts and stores message, retrieves account status, and then forwards the message to the intended recipient (Katankar & Thakare, 2010).

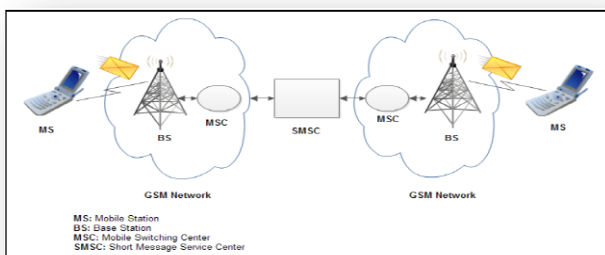


Figure 3: SMS Architecture.

E-mail Technology

Everyone owns at least one e-mail address, which he/she uses to communicate with family, friends, and business partners. Newsletters, notifications, and advertisements can also be received via e-mail (Cernian, Florea, Carstoiu, & Sgarciu, 2011). According to Wisker (2009), e-mail is widely compared with other communication tools. Therefore, this communication tool has many advantages, such as easy to use and fast message delivery. E-mail also allows for asynchronous communication, which means that communication does not occur at the same time and the recipient can read the message anytime. The e-mail technology is inexpensive or free. In addition, large files or documents can be attached and sent easily. E-mails are also useful for communicating between long distances and different time zones. For the previous reasons, the CPIS used e-mails to send notification to students when announcing the expiry date of their insurance. Students are notified automatically one week before the expiry date of their insurance to ensure that the students can renew their insurance. Figure 3 attempts to simplify the process in which e-mails are sent and received (Coulouris, Dollimore, & Kindberg, 2005).

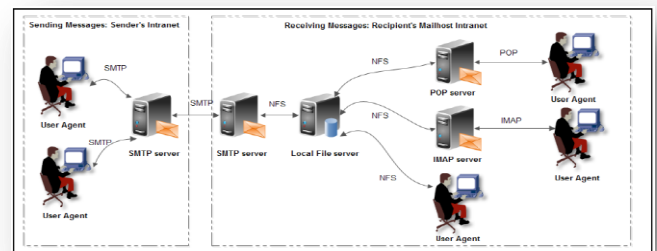


Figure 4: E-mail Architecture.

Related Work

Web-based applications are used at the clinic as a main information source for service providers and patients (Yu & Panova, 2012). Therefore, Internet health sites can be used to replace face-to-face consultations, supplement forms of care that is in existence, and create favorable circumstances to strengthen the participation of the patient (Dedding, van Doorn, Winkler & Reis, 2011). Many studies have focused on developing a website dedicated to health (see Table 2).

Table 2: Studies on E-health.

| Author(s) | Year | Title | Objective |
|--------------------------------------|------|--|--|
| Maizatul | 2002 | Claim Management System (CMS). | website to facilitate Medical financial transactions for staff in UUM |
| Cruz, Limia, Gonzalez, and Denis | 2003 | Website for hospitals technological management system support. | To develop a website wherein users will have the ability to find a guide for implementing hospital technological management and downloading the informatics system for maintenance management. |
| Ma Zhongming and Ng NaiFatt | 2003 | Medical signal transmission and analysis based on the Internet. | Develop a web-based system to enable patients to send their ECG data to a web server. |
| Hamouda | 2008 | Improving the clinic Appointment System: A case study of UUM clinic. | To develop a web-based system to reduce long waiting time for patients. |
| Dalbouh | 2009 | Mobile Tracking on Patient Progress. | To use mobile application to store and follow up the patient's state. |
| Bassfar | 2010 | Develop a prototype of dental appointment system. | To develop a prototype of dental appointment system based on SMS services. |
| Fujimura, Shiraishi, Maeda, and Itoh | 2010 | Effect of web-based healthcare system on behavior modification. | To develop a web-based healthcare system to encourage people in continuing their efforts to change their lifestyle habits. |
| Doi, Kimura, Suzuki, and Takabayashi | 2012 | Development of Doctors Search Engine based on ICD-10. | To develop a website for Chiba University Hospital that has much information and helps visitors to find all types of information about the hospital. |

Additionally, a study is conducted in UUM to develop a website for the medical history of international students (Shaladi, 2012). This system used the insurance number to search for student profiles. However, this system does not allow the direct addition of the insurance coverage amount via the system. Therefore, the student must bring his/her insurance paper so that hospitals can use the insurance number to search for the patient profile. The patient profile does not contain information about insurance. Thus, CPIS allows insurance companies to add the insurance coverage amount of the international students in UUM directly via the system.

Almost all insurance companies have a web page for presenting information and the products they offer. This web page markets company support and is equivalent to an online brochure. As mentioned by Sekolovska (2012), no interaction exists between clients and company, and the insurance company still depends on physical channels of distribution. This strategy solely straightens the traditional way of distributing insurance policies.

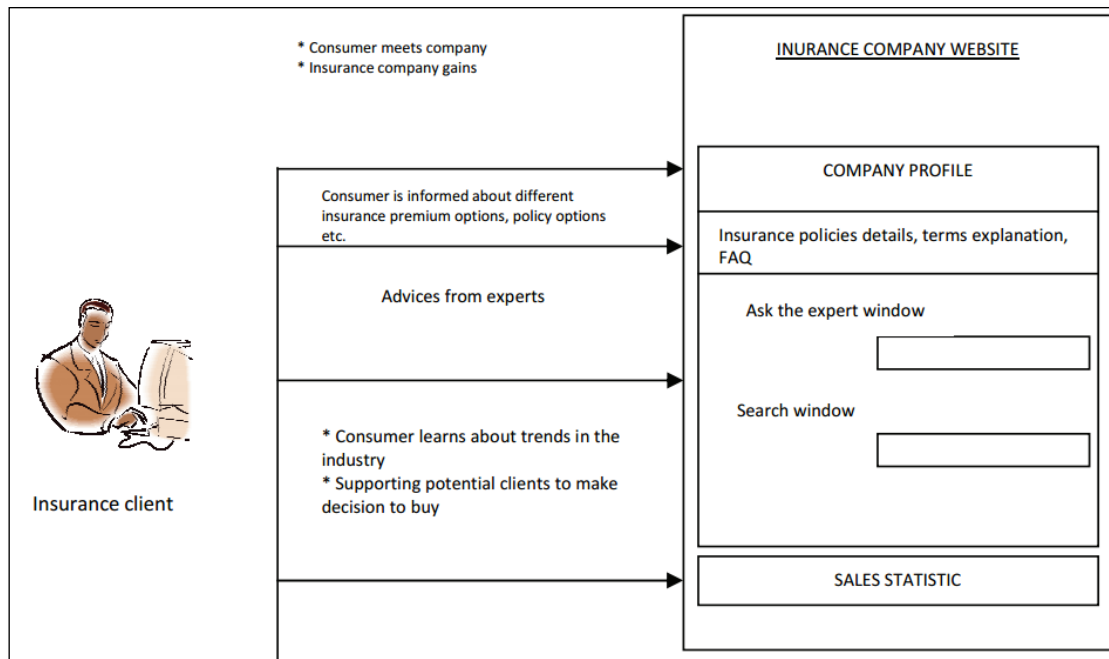


Figure5: Architecture of E-insurance Website Application.

A study attempted to create a website to facilitate medical financial transactions for the staff in UUM (Maizatul, 2002). The website was limited to the staff of UUM. According to the researcher, his study is limited because the website did not contain a search engine that facilitates work for users. The CPIS for international students in UUM does not need any physical materials for verification because the system has a search engine that allows information search by using the passport number. In addition many universities built a website for health insurance to improve the health services for students such as University of Georgia built Student Health Insurance Program (SHIP) website to announce the insurance rules and forms for students and University Strathclyde Glasgow try built Online Student Payment System to make the student pay the insurance fees Online.

RESEARCH METHODOLOGY

This study utilizes rapid application development (RAD). According to Mughal, Amini, Elson, and Reynolds (2010), the most revolutionary and successful change in IT business practices today is the RAD. The RAD shows substantial advantage over other methodologies. The fundamental principle of RAD is one of these advantages, that is, a project is started as early as possible, and the prototype can be modified after evaluation (Beynon-Davies, Carne, Mackay & Tudhope, 1999). According to Martin (1991), "The RAD is a Lifecycle design development to give a development that is much faster and results of higher-quality than those achieved through the traditional Lifecycle." In general, the RAD development life cycle allows software to be written

much faster, and requirements in turn can be changed much easier. RAD consists of four phases: i) requirement planning phase, ii) user design phase, iii) construction phase, and iv) cutover phase.

The requirement planning phase involves fully understanding the life cycle of the prototype and realizing all the integrated elements of system planning and system analysis. The problem statement of this study came from the literature review and the interviews. The researcher conducted interviews with the insurance company and clinic in UUM to identify the system requirements in designing the CPIS for UUM international students. The interview was conducted with a small number of staff because of lack of time just three members from insurance company and two from clinic. The basic steps of the interview are as follows: a) Choosing interviewees: in this step, interviewees were chosen based on requirements. The interviewees were taken from the staff of the insurance company and the clinic in UUM ;b) Formulating the questions for the interview: in this step, the final design of the questions for the interviewees was formulated to elicit their opinion on the relation between clinic and insurance company and how this relation can be improved for the benefit of the international student benefit, as well as how the hospital check the insurance for the international student in UUM ;c) Conducting the interview: in this step, the researcher determines the requirements of the system.

The requirements in this study were gathered based on the interviews and literature review. Figure 6 depicts the architecture proposed in developing the prototype of CPIS for international students in UUM.

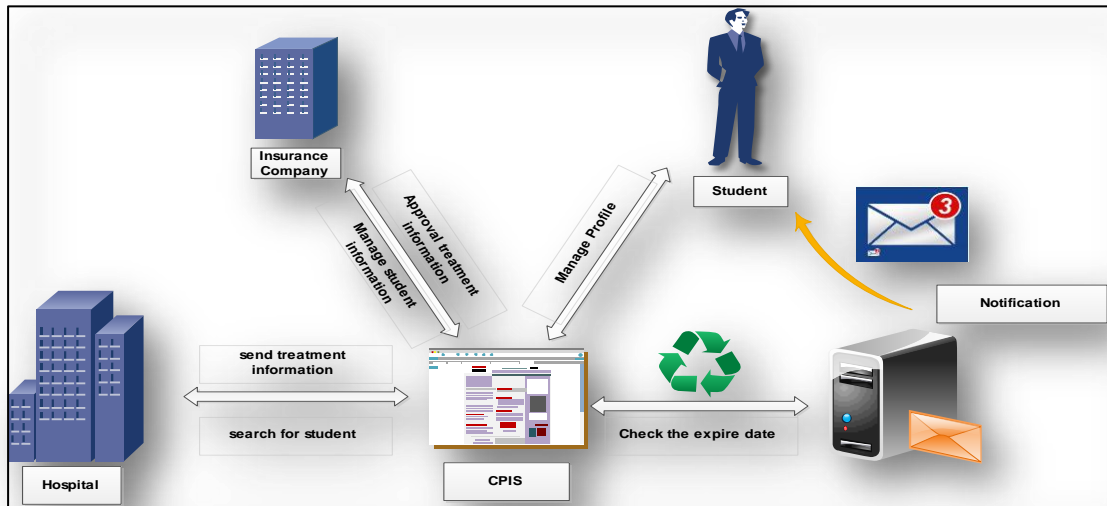


Figure 6: CPIS Architecture.

ANALYSIS

The users interact during the model development and the system analysis in the user design phase. The staff for insurance company, hospital staff and students participated in the study. The user (insurance staff, hospital staff, and students) selects the enterprise and enters the system by using his/her username and password. The insurance staff can manage student information, such as insert, update,

and delete student information. In addition, when the insurance staff login, the system automatically will send notification by Email of the insurance date expiry of students before seven days. Both insurance and hospital staff can search for student information. The hospital staff can send student information to the insurance company, and the company can approval the information. The student can manage his or her profile. Figure 7 shows the use case diagram of CPIS.

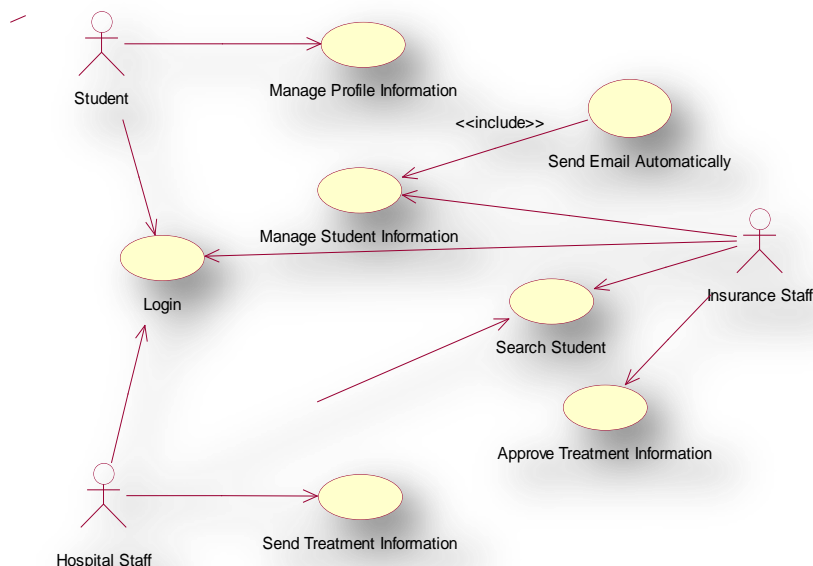


Figure 7: Use Case Diagram of CPIS.

After obtaining the design in the user design phase, the construction phase follows. The construction phase focuses on the development of the application and the program. Visual Studio 2005 with Microsoft.NET framework was used in this study to develop a prototype of CPIS. The C# programming language was used to design the class, and ASP.net was used to design the interface of the CPIS

prototype. The SQL language was used to implement the database of the CPIS prototype, and the IIS was used as web server.

After the student logs in to the prototype, he/she can view and update his or her information, including his or her personal information and insurance information. Figure 81 shows the interface view of the student information for CPIS.

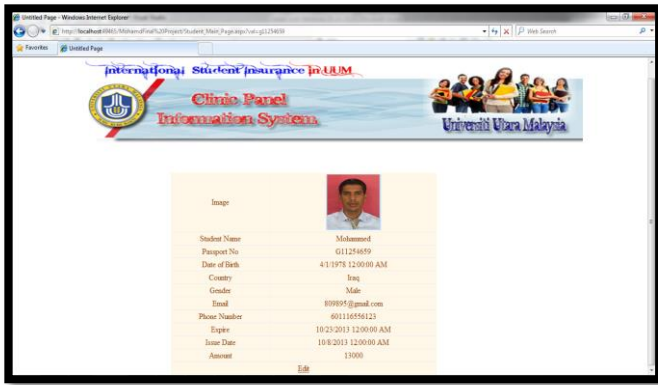


Figure 8: Viewing and Updating of Student Information.

The hospital staff has the ability to send information, such as passport number, amount of treatment or surgery, treatment date, and reminder of insurance amount, to students. Figure 9 shows the interface of Send Treatment Information for CPIS. The hospital/insurance staff has the ability to search student information by entering the passport number for the student and pressing the search button. Figure 102 shows the interface of search student information for CPIS.

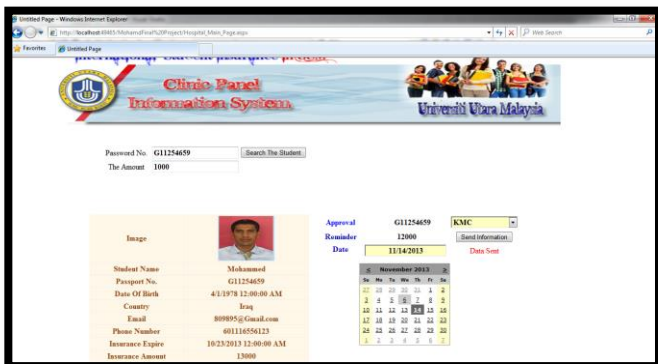


Figure 93: Send Treatment Information.

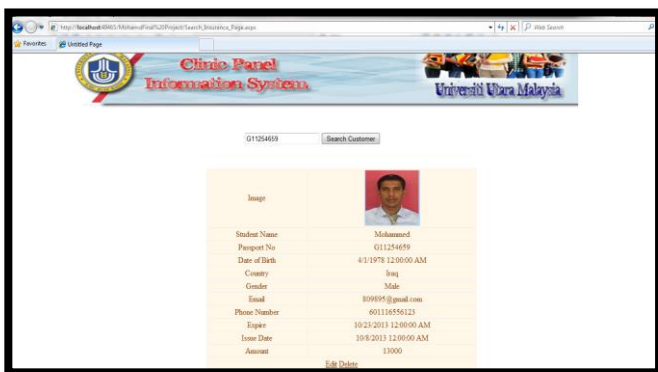


Figure 104: Search Student Information.

The insurance staff has the ability to approve student's information sent by the hospital and will approve the new amount of insurance by selecting the student then pressing the "Approve" button. Figure 11

shows the interface of approving the treatment information for CPIS.

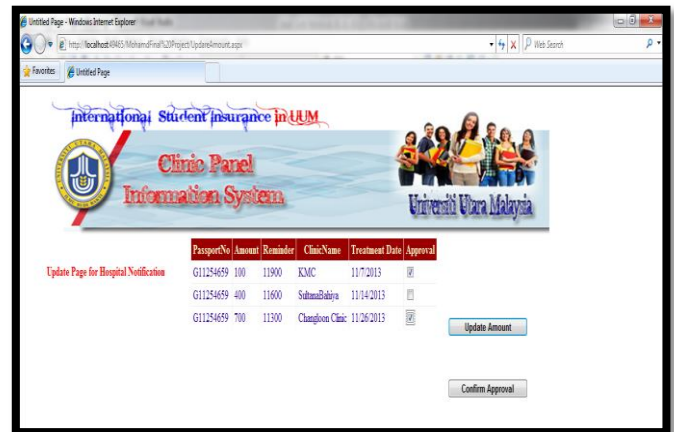


Figure 11: Approving Treatment Information.

Overall, the previous interfaces showed the main functions for the CPIS prototype, in which the functions make the verification process take less time. However, no interface exists for sending automatically the expiration date of insurance, which is coded inside the pages, via e-mail.

The cutover phase represents the final phase of developing and testing the CPIS prototype. This phase evaluated and determined the uses and the operability of the prototype. Evaluation was conducted through a questionnaire. The rating based on the usability and the testing is in accordance with Brooke's system usability scale (SUS) (Bangor, Kortum & Miller, 2008). After the development processes, the prototype was evaluated by 36 users. The evaluation aims to determine user satisfaction, ease of use, and operability of the prototype. The SUS questionnaire comprises two sections: general information and user evaluation.

Demography Information

Figure 12 shows that the respondents comprise 22 males (61.1%) and 14 females (38.95). The respondents' age varied in this survey. A total of 13 (36.1%) respondents are 25 years to 29 years old and 22 (61.1%) are 30 years to 39 years old. These groups are the majority of the respondents, as described in Figure 13. One respondent (2.8%) has age ranging from 40 years to 49 years old. Figure 14 shows that the occupation of the respondents can be classified into three types: 3 insurance employees (8.3%), 3 clinic employees (8.3%), and 30 International students (83.3%).

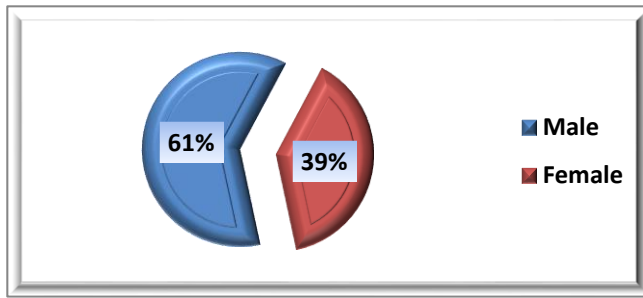


Figure 12: Respondents Depending on Gender.

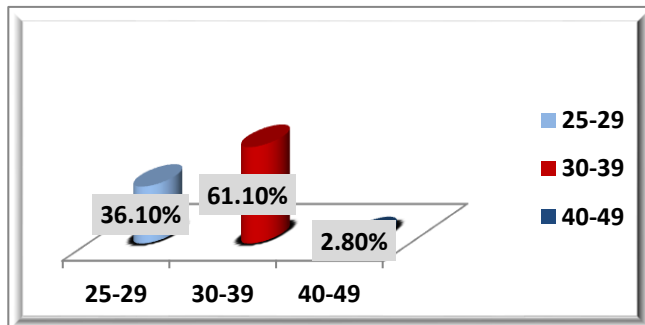


Figure 13: Respondents Depending on Age.

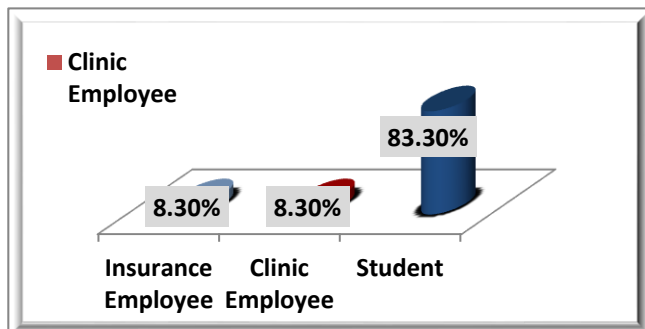


Figure 14: Respondents Occupation.

Evaluation of User

User assessment is an important measure of the performance of any system. For the CPIS prototype, the system should be assessed by the insurance staff, health staff, and international students. The survey chose twelve questions, and each question was rated from 1 to 5. The questionnaires have two dimensions, namely, usefulness and easy to use, with mean of 4.1528 and 4.4074, respectively. The mean of each dimension is above (4). Table 3 illustrates the mean for every question.

Table 3: Statistics for all questions.

| Perceived Usefulness | | Mean |
|-----------------------|---|--------|
| Q1 | Using CPIS helps me become more effective | 4.3056 |
| Q2 | Using CPIS helps me become more productive | 3.8056 |
| Q3 | Using CPIS saves my time | 4.3611 |
| Q4 | Using CPIS would enhance my effectiveness | 4.2222 |
| Q5 | Using CPIS would make it easier to do my tasks | 4.0833 |
| Q6 | CPIS was everything I would expect it to do | 4.1389 |
| Perceived Easy to Use | | |
| Q7 | CPIS is simple to use | 4.2500 |
| Q8 | CPIS is very friendly to use | 4.3611 |
| Q9 | CPIS requires the fewest steps possible to accomplish what I want to do with it | 4.6389 |
| Q10 | I can use CPIS without written instructions | 4.2500 |
| Q11 | I did not notice any inconsistencies as I use CPIS | 4.2222 |
| Q12 | I can use CPIS successfully every time | 4.7222 |

The measurement function is important when developing any system or any prototype. The measurement function helps immediately uncover the usability defects during the design. Moreover, the results of the CPIS evaluation denoted that the prototype has successful functions. However, the prototype still requires improvement.

CONCLUSION

Insurance is related in many commercial and service fields, including healthcare. In this study the CPIS enables information access between insurance companies and health institutions via ICT. The international students in UUM face obstacles when they visit hospitals without bringing insurance papers or insurance ID, especially in emergency cases. The key role of the CPIS is to make a connection point among the university, insurance company, and hospitals to speed up the treatment process and to ensure that the information of students is updated. The system uses notifications to encourage students to renew their insurance contracts. Requirements are collected via two ways interviews with insurance company and health staff and from previous studies. The system functions were analyzed by the UML diagram and implemented by C# with ASP.NET in Visual Studio 2005. The system was evaluated by using questionnaire (SUS) for a total of 36 users and their satisfaction regarding the usefulness and ease of

use of the prototype was collected as well as this study presented positive results.

FUTURE WORK

Nowadays, ICT is used in many fields, including health and health insurance. This study tries to create a channel of communication between hospitals and insurance companies to remove the administrative burden from health personnel, thus improving their performance. The future work of this research covers the following:

- i. Give authorization to students in filling out the health insurance form online. Payment to the insurance company should be made online to reduce pressure on the insurance staff. As a result, the insurance company will need a small number of staff to manage student files.
- ii. The mainstream system should not be limited to international students only.
- iii. The system security should be increased to ensure safety of payments made through the Internet.

CONTRIBUTION

Student identification usually requires identification papers or health insurance identity. However, this approach delays the treatment of students. This study contributes to speeding up this process, thus positively affecting the patient's health. The CPIS increases the medical facilities for international students due to increasing number of international student in UUM.

REFERENCES

Agoyi, M., & Seral, D. (2010). SMS Security: An Asymmetric Encryption Approach. Paper presented at the Wireless and Mobile Communications (ICWMC), 2010 6th International Conference on.

Alam, A., Salim, M., & Shah, H. (2010). The Potential of E-commerce in the Insurance Industry: The Road Ahead. *Global Journal of Enterprise Information System*, 1(1).

Álamo, J. M. R., Sarkar, T., & Wong, J. (2008, December). Composition of services for notification in smart homes. In *Universal Communication, 2008. ISUC'08. Second International Symposium on* (pp. 75-78). IEEE.

Alawneh, R., El Sheikh, A., & Kanaan, R. (2011). Development of Embedded Personal Health Care Record System. *iBusiness*, 3.

Alipour, M., Dorodi, H., & Pishgahi, S. (2011). Feasibility Study of e-Insurance Services in Iranian Insurance Companies (Asia Insurance Co). *International Journal of Business and Social Science*, 2(10).

Amirshahi, M., & Karimian, L. (2006). Identification of Appropriate Insurance Policies for e-selling in Iran, with the Help of Kare-Silver's Electronic Shopping Test'. Paper presented at the Management of

Innovation and Technology, 2006 IEEE International Conference on.

Ammenwerth, E., & Spötl, H. (2009). The time needed for clinical documentation versus direct patient care. *Methods Inf Med*, 48(1), 84-91.

Amor, D. (2002). *Internet future strategies: how pervasive computing will change the world*: Prentice Hall.

Apampa, O. R. (2010). Evaluation of ICT Penetration in Selected Insurance Companies: The Lagos Experience. *Journal of Emerging Trends in Computing and Information Sciences*, 1(1), 24.

Bakker, H., & Iacob, M. E. (2009). Web-services in the dutch healthcare insurance sector: expected versus achieved benefits. Paper presented at the Proceedings of the 2009 ACM symposium on Applied Computing.

Bangor, A., & Kortum, T. P., T. Miller, J. (2008) An Empirical Evaluation of the System Usability Scale. *Intl Journal of Human-Computer Interaction*, 24(6), 574-594.

Bassfar, Z. A. (2010). Developing a Prototype of Dental Appointment System. Master thesis, Universiti Utara Malaysia.

Beynon-Davies, P., Carne, C., Mackay, H., & Tudhope, D. (1999). Rapid application development (RAD): an empirical review. *European Journal of Information Systems*, 8(3), 211-223.

Blumenthal, D. (2009). Stimulating the adoption of health information technology. *New England Journal of Medicine*, 360(15), 1477-1479.

Buyukozkan, G., & Cifci, G. (2010, June). An integrated multi criteria decision making approach for electronic service quality analysis of healthcare industry. In *Information Society (i-Society), 2010 International Conference on* (pp. 522-527). IEEE.

Cernian, A. S., Florea, I., Carstoiu, D., & Sgarciu, V. (2011, September). The design and validation of an automatic email clustering system based on semantics. In *Intelligent Data Acquisition and Advanced Computing Systems (IDAACS), 2011 IEEE 6th International Conference on* (Vol. 2, pp. 629-632). IEEE.

Coulouris, G. F., Dollimore, J., & Kindberg, T. (2005). *Distributed systems: concepts and design*: Addison-Wesley Longman.

Coviello, A. The impact of ICT in the insurance industry: the role of Customer Relationship Management. Retrieved October 16, 2013, from <http://www.cersi.it/itais2012/pdf/002.pdf>.

Cruz, A. M., Limia, A. T., Gonzalez, A., Denis, E. R., & Sanchez, M. C. (2003, September). Website for hospitals technological management system support. In *Engineering in Medicine and Biology Society, 2003. Proceedings of the 25th Annual International*

Conference of the IEEE (Vol. 4, pp. 3669-3671). IEEE.

Dalbouh, H. A. (2009). Mobile Tracking on Patient Progress(m-TOPP). Master thesis, Universiti Utara Malaysia.

Das, S., & Kratz, M. (2012). Alarm system for insurance companies: A strategy for capital allocation. *Insurance: Mathematics and Economics*, 51(1), 53-65.

Dedding, C., van Doorn, R., Winkler, L., & Reis, R. (2011). How will e-health affect patient participation in the clinic? A review of e-health studies and the current evidence for changes in the relationship between medical professionals and patients. *Social science & medicine*, 72(1), 49-53.

Díaz, M., Galimany, J., Estrada, J., & Blanca, I. (2013). Introduction, Use and Spread of ICT in Health Systems: Impact on Patients, Professionals and Health Organizations. *INTED2013 Proceedings*, 1830-1833.

Dinevski, D., & Poli, A. (2009). Integration of e-Health systems with the Open Source approach and O3 example. Paper presented at the Information Technology Interfaces, 2009. ITI'09. Proceedings of the ITI 2009 31st International Conference on.

Eysenbach, G. (2001). What is e-health? *Journal of medical Internet research*, 3(2). Retrieved September 8, 2013, from : <http://www.jmir.org/2001/2/e20/>.

Fardoun, H. M., Alghazzawi, D. M., & Ciprés, A. P. (2012). TabletNet: Utility, Usability and User Interface Quality. *Education Statistics Quarterly*, 2(4).

Fujimura, K., Shiraishi, M., Maeda, Y., & Itoh, M. (2010, June). Effect of web-based healthcare system on behavior modification. In *Information and Telecommunication Technologies (APSITT)*, 2010 8th Asia-Pacific Symposium on (pp. 1-6). IEEE.

Hamouda, S. (2008). Improvement to the Appointment System for Clinic: A case study in UUM Clinic. Universiti Utara Malaysia.

Hiwarkar, T., & Khot, P. G. E-Insurance: Analysis of the Collision and Allegation of E-Commerce on the Insurance and Banking. Retrieved October 16, 2013, from : http://www.borjournals.com/Research_papers/Jun_20_13/1298M.pdf

Katankar, V. K., & Thakare, V. (2010). Short Message Service using SMS Gateway. *International Journal on Computer Science and Engineering*, 2(04), 1487-1491.

Kimura, T., Suzuki, T., & Takabayashi, K. (2012, November). Development of Doctors Search Engine based on ICD-10. In *Soft Computing and Intelligent Systems (SCIS) and 13th International Symposium on Advanced Intelligent Systems (ISIS)*, 2012 Joint 6th International Conference on (pp. 795-798). IEEE.

Lewis, D., Hodge, N., Gamage, D., & Whittaker, M. (2012). Understanding the role of technology in health information systems. *Pacific health dialog*, 18(1), 144-154. Retrieved October 10, 2013, from : <http://www.uq.edu.au/hishub/docs/WP17/HISHUB-WP17-02-WEB-6Nov2012.pdf>.

Li, J. J., Mallows, C. L., & Landwehr, J. (2012, July). Capacity Evaluation of Multi-modal Network Notification Service. In *Computer Software and Applications Conference (COMPSAC)*, 2012 IEEE 36th Annual (pp. 62-71). IEEE.

Liu, X., Heo, J., & Sha, L. (2005). Modeling 3-tiered web applications. Paper presented at the Modeling, Analysis, and Simulation of Computer and Telecommunication Systems, 2005. 13th IEEE International Symposium on.

Louca, S. (2012). Personalized medicine—a tailored health care system: challenges and opportunities. *Croatian medical journal*, 53(3), 211-213.

Maizatul Hanis, I. (2002). Claim Management System (CMS). Universiti Utara Malaysia.

Martin, J. (1991). Rapid application development. Macmillan Publishing Co., Inc.

Masclans, J. G., Roger, M. R., & Pegueroles, A. F. (2011). Training of nurses for the effective implementation of information and communication technology in health care system. *ICER2011 Proceedings*, 973-976.

Mohamed, N., Al-Jaroodi, J., & Jawhar, I. (2008, July). A generic notification system for Internet information. In *Information Reuse and Integration*, 2008. IRI 2008. IEEE International Conference on (pp. 166-171). IEEE.

Moreno, L., Peterson, S., Bagchi, A., & af Ursin, R. (2007). Personal Health Records: What Do Underserved Consumers Want? : Mathematica Policy Research, Incorporated.

Mubaraka, C. M., Momanyi, W. K., & Jibia, M. S. (2013). Integrating ICT in Insurance Management: Design & Development of an Online Insurance System for E. Africa Insurance Company. *Journal of Information Engineering and Applications*, 3(5), 10-20.

NewNet. (1999). Wireless Short Message Service Tutorial. Retrieved October, 2013, from http://www.mobilein.com/SMS_tutorial.pdf.

Odoyo, F. S., & Nyangosi, R. (2011). E-Insurance: An Empirical Study of Perceived Benefits. *International Journal of Business and Social Science*, 2(21), 166-171.

Robert Auger, C. C., Jeremiah Grossman, Sverre H. Huseby, Aaron C. Newman, Ray Pompon, Dennis Groves, Ivan Ristic. (February 23, 2004). Web Application Security Consortium. Retrieved October, 2013, from <http://www.webappsec.org>.

Sanayei, A., Torkestani, M., & Ahadi, P. (2012). Readiness Assessment of Iran's Insurance Industry for E-Commerce and E-Insurance Success. *International Journal of Information Science and Management (IJISM)*, 7(1), 91-105.

Schubert, P., & Leimstoll, U. (2006). The Importance of ICT: An Empirical Study in Swiss SMEs. *Proceedings of the 19th International Bled eConference on eValues, Bled, Slovenia, June, 5-7.*

Sekolovska, M. (2012). Internet Business Models for E-Insurance and Conditions in Republic of Macedonia. *Procedia-Social and Behavioral Sciences*, 44, 163-168.

Shaladi, T. (2012). Sharing Medical Profiles for International Students in UUM .Master thesis, Universiti Utara Malaysia.

Wangpipatwong, S., Chutimaskul, W., & Papasratorn, B. (2005). Factors influencing the adoption of Thai eGovernment websites: information quality and system quality approach. Paper presented at the *Proceedings of the Fourth International Conference on eBusiness, Bangkok.*

Wirtz, B. W., Schilke, O., & Ullrich, S. (2010). Strategic development of business models: implications of the Web 2.0 for creating value on the Internet. *Long Range Planning*, 43(2), 272-290.

Wisker, G. (2009). *The undergraduate research handbook*: Palgrave Macmillan.

Yang, T.-M., & Maxwell, T. A. (2011). Information-sharing in public organizations: A literature review of interpersonal, intra-organizational and inter-organizational success factors. *Government Information Quarterly*, 28(2), 164-175.

Yao, J. T. (2008). An introduction to Web-based support systems. *Journal of Intelligent Systems*, 17(1-3), 267-282.

Yousefi, A. (2011). The impact of information and communication technology on economic growth: evidence from developed and developing countries. *Economics of Innovation and New Technology*, 20(6), 581-596.

Yu, W. D., & Panova, A. (2012). An architectural design framework for an Electronic Health Record system with hospice application. Paper presented at the *e-Health Networking, Applications and Services (Healthcom), 2012 IEEE 14th International Conference on.*

Zhongming, M., & Fatt, N. N. (2003, April). Medical signal transmission and analysis based on the Internet. In *Information Technology Applications in Biomedicine, 2003. 4th International IEEE EMBS Special Topic Conference on*(pp. 74-77). IEEE.

Ziemer, S. (2002). *An Architecture for Web Applications*. Essay in DIF, 8914, 9-11.