

Implementation Differences of Hospital Information System (HIS) in Malaysian Public Hospitals

Nurul Izzatty Ismail, Nor Hazana Abdullah, Alina Shamsudin, and Nik Azliza Nik Ariffin

Abstract—Hospital Information System (HIS) is important to healthcare sector especially in public hospitals as they need to serve the public with high-quality healthcare treatments. HIS helps to improve patients care services. Thus, the Malaysian Government has introduced three (3) categories of HIS namely Total Hospital Information System (THIS), Intermediate Hospital Information System (IHIS), and Basic Hospital Information System (BHIS) among Malaysian public hospitals. However, only 15.2% of the Malaysian public hospitals are implementing the system. Moreover, there is limited number of empirical studies on HIS implementation in Malaysia. Thus, this paper aims to investigate issues and challenges in HIS implementation for each category of HIS by using in-depth interviews. Nine participants were involved in the interviews. The interview data were transcribed verbatim and analysed based on Content and Thematic Analysis using NVivo software. The results showed that different category of HIS faced different issues and challenges.

Index Terms—Basic hospital information system, hospital information system, intermediate hospital information system, total hospital information system.

I. INTRODUCTION

Information technology (IT) has become vital in healthcare sector including public hospitals. The technology has been found to play significant role in improving patients care services. In Malaysia, the healthcare sector is divided into three healthcare providers, which are public, private, and Non-Governmental Organisations (NGOs) [1]. Specifically, public healthcare sector, especially the hospitals, has complex system. The public healthcare sector has more complex workflows than other healthcare providers. Moreover, the public hospitals have large number of patients – from the rich to the poor to get medical treatments, unlike the private hospitals that focus only on the rich who could afford to pay expensive medical bills. Therefore, the large number of patients in public hospitals may lead to complex and complicated environment. This may also lead to inefficient system implementation; patients need to wait for a long time before getting their medical treatment. This issue is related to low quality of healthcare services in public

hospitals. In fact, the statistics by the Ministry of Health shows increasing number of negligence cases reported between 2000 and 2008 [2]. Hence, Hospital Information System (HIS) is hoped to improve the quality of healthcare services.

II. LITERATURE REVIEW

A. Hospital Information System (HIS)

HIS refers to a computer system designed to manage all the hospital's medical and administrative information in order to enable health professionals to perform their jobs more effectively and efficiently [3]. Moreover, HIS manages all the information processing activities within hospital to achieve high-quality patients care services and medical research [4]. HIS consists of at least two of the following components: Clinical Information System (CIS), Financial Information System (FIS), Laboratory Information System (LIS), Nursing Information System (NIS), Pharmacy Information System (PIS), Picture Archiving and Communication System (PACS), and Radiology Information System (RIS) [3]. Each category has its own function, department and users in improving hospital services. Table I tabulates the description for each component including its respective function, and department and users of the component.

HIS has many benefits to hospitals [5-36]. However, in the same time, there are several issues and challenges in HIS implementation [37-48]. Table II shows the benefits, the issues and challenges in the implementation of HIS according to previous researchers. The table verifies that HIS implementation is not easy.

In terms of division of HIS implementation, Budkin [49] describes that HIS implementation process is categorised into planning, design, implementation, and operation. Next, Houser et al. [50] indicate that HIS implementation process is divided into three (3) phases, which are preparatory activities for system implementation, certification and acceptance testing, and system implementation. But, according to Rossi [51], HIS implementation process is categorised into two (2) phases only, which are preparatory phase and utilisation phase, specifically, in Malaysia, Hassan [52], Mohd, and Syed Mohd. [5], Abdul Hamid [53], and Ismail et al. [54] describe that HIS implementation process is divided into three (3) stages, which are pre-implementation stage, implementation stage, and post-implementation stage. Therefore, all these researchers have similar opinions on division of HIS implementation.

Manuscript received November 15, 2012; revised January 16, 2013. This work was supported by Faculty of Technology Management, University of Tun Hussein Onn Malaysia and University Technology MARA. The authors would like to thank Hospital Sultan Ismail, Hospital Keningau and Hospital Tuanku Jaafar for supportive response to interview data.

Nurul Izzatty Ismail, Nor Hazana Abdullah, and Alina Shamsudin are with the Department of Technology Management, Universiti Tun Hussein Onn, Johor, 86400 Malaysia (e-mail: zetty_1986@yahoo.com, hazana@uthm.edu.my, alina@uthm.edu.my).

Nik Azliza Nik Ariffin is with the Department of Record Management of University Technology MARA Puncak Perdana, Shah Alam, Selangor, 40450 Malaysia (e-mail: nikazliza@salam.uitm.edu.my).

TABLE I: HIS COMPONENTS AND THEIR FUNCTIONS, DEPARTMENTS AND USERS OF THE COMPONENT

HIS Component	Function	Descriptions	
		Department	User
CIS	Computer-based system designed for collecting, storing, manipulating, and making available clinical information important to the healthcare delivery process.	Clinical	Doctors, Nurses
FIS	Computer system that manages the business aspects of a hospital; used by accountants in financial department.	Financial	Accountants
LIS	Computer information system that manages laboratory information for all the laboratory disciplines such as clinical chemistry, haematology, and microbiology, which are used in laboratory by laboratory officers.	Laboratory	Lab officers, Doctors
NIS	Computer system that manages clinical data from various healthcare environments; available in a timely and orderly fashion to aid doctors and especially nurses in improving patients care.	Ward	Nurses, Doctors
PIS	Complex computer system designed to meet the needs of pharmacy department.	Pharmacy	Pharmacists, Doctors
PACS	A loose term to describe a set of systems that facilitates the archiving, processing, and viewing of digital radiological images and their related information; this system is used in x-ray and imaging department.	Imaging	Imaging Officers, Doctors
RIS	Computer system that assists radiology services in the storing, manipulating and retrieving patients' information.	Radiology	Radiologists, Doctors

TABLE II: HIS BENEFITS, ISSUES AND CHALLENGES

HIS Benefits	Researchers	HIS Issues and Challenges	Researchers
Accessible	[5]; [6]; [7]; [8]; [9]; [10];	High initial cost	[37]; [38]; [39]; [40]; [26]; [41]
Remote access	[11]; [12]; [6]; [13]	High initial physician time	[39]; [40]; [38]; [42]; [43]
Save time and space	[14]; [15]; [16]; [17]; [10]; [19]; [20]; [21]; [22]	Technology and technical matters	[37]; [44]; [45]; [46]; [41].
Up-to-date and accurate	[12], [23]	Fundamental problems such as lack of computer skills, complex tasks, complex functions	[6]; [10]; [30]; [37]; [47]; [48]
Decrease medical errors	[24]; [25]; [26]; [27]; [28]; [29]; [30]; [31]; [32]; [33]; [34]; [35]; [36]	Ethical issues such as certification, security, privacy and confidentiality	[26]; [41]; [48]

B. Implementation of HIS in Malaysia

According to Abdul Hamid [53], the planning of HIS implementation began in 1993, which started under 6th Malaysian Plan (MP), in Hospital Selayang and termed as THIS. Then, in 1996, telehealth project was launched on the 1st August 1996. Moreover, HIS implementation took place along with physical construction under the 7th MP. Today, only 21 out of 138 public hospitals are implementing the system [2, 53, 54]. Thus, the level of HIS implementation is still low.

C. Categories of HIS

There are three (3) categories of HIS, which are THIS, IHIS, and BHIS. As mentioned earlier, out of 138 public hospitals, 21 public hospitals are implementing any of these categories of the system [2, 5, 53, 54]. Table III tabulates the hospitals into THIS, IHIS, and BHIS. Based on the table, hospital size is vital to indicate the categories of HIS. THIS is for the hospitals with more than 400 beds, IHIS is for hospitals with more than 200 beds but less than 400 beds, and BHIS is for hospitals with less than 200 beds.

Moreover, each category of HIS has different set of information system as shown in Table III. THIS has more complete set of HIS than IHIS and BHIS. Moreover, the hospitals implementing THIS are also known as “paperless hospitals”.

III. RESEARCH METHODOLOGY

The research design of this study is multiple case studies. According to Yin [56], this research design supports the nature of the study. In this study, three cases were selected for purposive sampling. According to Merriam [57], purposive sampling is based on the assumption that the researcher wants to investigate and understand an issue based on several samples. The three cases selected were Hospital Sultan Ismail, Hospital Keningau, and Hospital Tuanku Ja’afar; each of these hospitals represents different categories of HIS. Hospital Sultan Ismail implements THIS, Hospital Keningan

implements IHIS, and Hospital Tuanku Ja'afar implements BHIS. Nine participants were selected among Hospital Directors, IT officers, and HIS users. Moreover, purposive sampling was used to ensure that the data collection was able to answer the research objectives. Besides that, snowball technique was used to investigate the HIS implementation process in Malaysian public hospitals.

TABLE III: HOSPITALS IMPLEMENTING HIS

Categories of HIS	Name of Hospitals	Components of HIS Implemented	Number of Beds	
THIS	Hospital Putrajaya,	Patient Management	More than 400 beds	
	Hospital Selayang,	System + Clinical Access		
	Hospital Pandan,	Information System + Laboratory		
IHIS	Hospital Ampang, Hospital Sg. Buloh, Hospital Alor Setar, Hospital Sungai Petani, Hospital Sultanah Zahirah, Hospital Sultan Haji Ahmad Shah and Hospital Bintulu	Information System + Picture Archiving and Communication System (PACS) + Administration Information System + Financial Information System + Inventory Information System + Personnel Information System	More than 200 beds but not less than 400 beds	
	BHIS	Hospital Kuala Batas, Hospital Setiu, Hospital Pekan, Hospital Pitas, Hospital Kuala Penyu, Hospital Kunak, Hospital Tuanku Ja'afar and Hospital Port Dickson		Patient Management System + Clinical Access Information System

Furthermore, qualitative method i.e., in-depth interviews, was selected to investigate the HIS implementation among the Malaysian public hospitals in details. According to Kvale [58], in-depth interviews allow primary data to be collected and enable the researchers to search and find further clarification about the answers given by the participants. In the interview session, which took about 60 minutes for each participant, an interview guide was prepared for investigating

the HIS implementation process. Malay and English languages were used as the main languages in the interview. The interviews were tape-recorded and later transcribed verbatim. For data analysis, Content and Thematic Analysis using computer software called NVivo was used. The data were triangulated with other supporting documents obtained during the study that served as the secondary data to ensure that the data were valid.

IV. RESULT

From the analysis, several issues have influenced overall HIS implementation in Malaysian public hospitals such as limited financial sources, maintenance by different department, HIS implementation order by the Malaysian Ministry of Health, addition of new systems, confidentiality issues, low acceptance level, low satisfaction level, different vendors, infrastructure issues, system breakdown, duplication of data, and different systems as shown in Table IV.

TABLE IV: RESULT OF ISSUES AND CHALLENGES OF HIS IMPLEMENTATION

Issues and Challenges	Participants								
	Hospital Sultan Ismail (THIS)			Hospital Keningau (IHIS)			Hospital Tuanku Ja'afar (BHIS)		
	1	2	3	4	5	6	7	8	9
Limited Financial Sources			√	√	√	√			√
Maintenance by Different Department	√		√	√	√	√			√
HIS Implementation Order by the Malaysian Ministry of Health	√	√	√	√	√	√	√		
Addition of New Systems					√	√			
Confidentiality Issues	√								
Low Acceptance Level					√	√	√	√	√
Low Satisfaction Level	√	√	√	√					
Different Vendors	√	√	√	√	√	√	√		
Infrastructure Issues	√			√	√		√	√	
System Breakdown		√		√		√	√		√
Duplication of Data	√	√			√	√			√
Different Systems	√	√	√	√	√	√			√

A. Limited Financial Sources

The implementation of HIS is expensive and the financial source comes from the Malaysian Government. The costs include start-up, maintenance, and training. The hospitals depend on the financial sources from the Malaysian Government. Although the hospitals obtain financial support from the Government to build hospitals with IT applications, the costs to maintain the system and train the users are increasing. Thus, the hospitals have limited financial sources other than the Government and they are in need of more financial sources to upgrade the system as well as to add new system. However, limited financial sources by the Government have made the system unchanged or not improved.

B. Maintenance by Different Departments

In THIS and BHIS hospitals, the IT department is responsible to maintain the system and to train new HIS users. However, hospitals especially those implementing IHIS have outsourced the responsibility to maintain the system. Thus, the difference in the department responsible for maintaining

the implementation of HIS between one HIS category to another has made it difficult for the system to be synchronised nationwide.

C. HIS Implementation Order by the Malaysian Ministry of Health

HIS Implementation is ordered by the Malaysian Ministry of Health (MOH). Usually, hospitals are built with the IT system, either THIS, IHIS or BHIS. Thus, the MOH has full authority of the overall HIS implementation.

D. Addition of New Systems

Due to limited financial sources as discussed earlier, the hospitals have difficulties in adding new systems to the currently used ones, especially for BHIS. However, the hospital with IHIS has added several new systems such as Day Care System, e-notification, e-registration and Registry Delivery System. These systems are developed as a cooperation work between the outsource company and the IT department of the hospital.

E. Confidentiality Issues

Hospital records are confidential. Thus, it is vital to keep all patients' data and records in a proper way. Thus, the system is designed to allow only authorised users with ID and password. However, the security level is not enough as all nurses or doctors can get access to all patients' data and records, under or not under their supervision.

F. Different Vendors

According to the participants, the hospitals with THIS, IHIS, and BHIS have multiple vendors to implement HIS. For example, Cerner is the main vendor for THIS in Hospital Sultan Ismail. Other than that, GE, Kaizen HR, and People Soft are also the vendors for Hospital Sultan Ismail for imaging, human resource, and billing. Meanwhile, in Hospital Keningau, I-Soft is the vendor implementing HIS in the hospital while Hi-Tech works in Hospital Tuanku Ja'afar.

G. Low Acceptance Level

There is low acceptance level by HIS users in the hospitals. According to the participants, most of the old-aged users especially among physicians have low acceptance towards the system. They believe that using the system is time-wasting because the system is too complex for them.

H. Low Satisfaction Level

Most HIS users have low satisfaction level because they want a more excellent system than the present one. They think that the present system is not good enough.

I. Infrastructure Issues

Due to limited number of computers and laptops, it is difficult for the hospitals to efficiently implement HIS in all hospitals.

J. System Breakdown

Sometimes the system breaks down when the users are dealing with the patients. This is one of the challenges of using the electronic system.

K. Duplication of Data

Sometimes the system breaks down when the users are dealing with the patients. This is one of the challenges of

using the electronic system.

L. Different Systems

According to interview result, each category of HIS has difference systems. For example, hospital of THIS has Radiology Information System, Laboratory Information System, Pharmacy Information System, Critical Care Information System, Picture Archiving & Communication System, Electronic Medical Records, Financial Information System, Administrative Systems and Dietary Information System. Moreover, the hospital with IHIS has Clinical Access, Person Management System, Billing System, Pharmacy Information System, Laboratory Information System, e-notification and Registry Delivery whereas the hospital with BHIS has Patient Management System, Billing information System, Dietary Information System, Ward Information System, Electronic Medical Records and Nurse and Staff Information System. Hence, it confirms that the different systems are depends on hospital needs.

V. CONCLUSION

In conclusion, different category of HIS faces different challenges. THIS has the most complete system whereas BHIS has the least complete and limited system. In addition, the most critical issues and challenges in HIS implementation are low of acceptance level and low of satisfaction level. Thus, these critical issues and challenges need to be studied and a HIS implementation model has to be developed using questionnaire as a quantitative approach for studying these issues and challenges in future work.

ACKNOWLEDGMENT

The authors would like to thank the relevant parties that have directly or indirectly contributed to the success of this study. Besides that, the authors wish to express their gratitude to the anonymous referees for their helpful comments and numerous suggestions to improve the paper.

REFERENCES

- [1] Ministry of Health Malaysia, *Country Health Plan: 10th Malaysia Plan*, Putrajaya, Malaysia: MOH, 2011.
- [2] Ministry of Health Malaysia, *Annual Report 2009*, Putrajaya, Malaysia: MOH, 2009.
- [3] Biomedical Informatics Ltd. (2006). Hospital Information System. [Online]. Available: <http://www.biohealthmatics.com/technologies/intsys.aspx>
- [4] A. Winter and R. Haux, "A three-level graph-based model for the management of hospital information systems," *Methods Inf Med.*, vol. 34, no. 4, pp. 378-396, September 1995.
- [5] H. Mohd and S. M. S. Mohd, "Acceptance model of Electronic Medical Record," *Journal of Advancing Information and Management Studies*, vol. 2, no. 1, June 2005.
- [6] H. S. Fraser *et al.*, "Implementing electronic medical record systems in developing countries," *Inform Prim Care*, vol. 13, no. 2, pp. 83-95, 2005.
- [7] L. A. Hakim, "IDEF3-based framework for web-based hospital information system," *Information Quality Management*, Hershey, PA, USA: IRM Press (IGI Global), 2007.
- [8] A. R. Bakker and J. L. Mol, "Hospital Information Systems," *Eff Health Care*, vol. 1, no. 4, pp. 215-223, December 1983.
- [9] T. Wendt *et al.*, "Modeling Hospital Information Systems (Part 2): using the 3LGM2 tool for modeling patient record management," *Methods Inf Med.*, vol. 43, no. 3, pp. 256-267, 2004.
- [10] N. M. Bananga *et al.*, "Use of technology in reproductive health information designed for communities in South Africa," *Health Education Research*, vol. 17, pp. 195-209, 2002.

- [11] J. W. Aaronson and C. L. M. Cullen, "Electronic Medical records: The Family Practice Resident Perspective," *Medical Informatics*, vol. 33, no. 2, pp. 128-132, 2001.
- [12] S. M. Powsner *et al.*, "Clinicians Are From Mars and Pathologists Are From Venus: Clinician Interpretation of Pathology Reports," *Arch Pathol Lab Med*, vol. 124, pp. 1040-1046, July 2000.
- [13] P. R. Vegoda and J. F. Dyro, "Implementation of an advanced clinical and administrative hospital information system," *Int J Clin Monit Comput.*, vol. 3, no. 4, pp. 259-268, 1986.
- [14] T. Bürkle *et al.*, "Stepwise evaluation of information systems in an university hospital," *Methods Inf Med*, vol. 38, no. 1, pp. 9-15, 1999.
- [15] T. D. Nguyen, "A Web-Based Electronic Medical Records and Hospital Information System for Developing Countries," pp. 155-170, March 2011.
- [16] N. F. M. Fadhil *et al.*, "Hospital Information System (HIS) Implementation in a Public Hospital," *Far East Journal of Psychology and Business*, vol. 8, no. 3, pp. 1-11, Sep 2012.
- [17] X. H. Le *et al.*, "Activity-oriented access control to ubiquitous hospital information and services," *Information Sciences*, vol. 180, pp. 2979-2990, 2010.
- [18] A. Donati *et al.*, "The impact of a clinical information system in an intensive care unit," *J Clin Monit Comput.*, vol. 22, no. 1, pp. 31-36, Feb 2008.
- [19] G. S. Harrison, "The Winchester experience with the TDS hospital information system," *Br J Urol.*, vol. 67, no. 5, pp. 532-535, May 1991.
- [20] D. K. Park *et al.*, "Smart information system for gachon university gih hospital," *Health Inform Res.*, vol. 18, no. 1, pp. 74-83, March 2012.
- [21] T. Garrido *et al.*, "Making the business case for hospital information systems--a Kaiser Permanente investment decision," *J Health Care Finance*, vol. 31, no. 2, pp. 16-25, 2004.
- [22] D. DeLia, "Hospital Capacity, Patient Flow, and Emergency Department Use in New Jersey: A Report to the New Jersey Department of Health and Senior Services," New Jersey, USA: Rutgers Center of Health State Policy, 2007.
- [23] K. Peterson, "Practice-based primary care research—translating research into practice through advanced technology," *Family Practice*, vol. 23, no. 2, pp. 149-150, April, 2006.
- [24] J. A. Menke *et al.*, "Computerized clinical documentation system in the pediatric intensive care unit," *BMC Med Inform Decis Mak*, vol. 1, no. 3, January 2001.
- [25] J. P. Glaser *et al.*, "Maximizing the benefits of health care information systems," *J Med Syst.*, vol. 10, no. 1, pp. 51-56, Feb 1986.
- [26] R. Hillestad *et al.*, "Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, And Costs," *Health Affairs*, vol. 24, no. 5, p.p 1103-1117, 2005.
- [27] H. Delbert and M. D. Meyer, "Electronic Medical Records-A Perspective: How Long Does It Take to Read a 243-page EMR?" *Journal of American Physicians and Surgeons*, vol. 15, no. 3, pp 78-79, 2011.
- [28] K. Chung *et al.*, "Toward efficient medication error reduction: error-reducing information management systems," *Journal of Medical Systems*, vol. 27, no. 6, pp. 553-560, 2003.
- [29] B. Barber *et al.*, "Security in hospital information systems," *Int J Biomed Comput*, vol 39, no. 1, pp. 133-138, April 1995.
- [30] J. G. Anderson, "Social, Ethical and Legal Barriers to E-health," *International Journal of Medical Informatics*, vol. 76, no. 5-6, pp. 480-483, 2007.
- [31] R. Kaushal *et al.*, "Imminent adopters of electronic health records in ambulatory care," *Inform Prim Care*, vol 17, no. 1, pp. 7-15, 2009.
- [32] R. Khorasani, "Computerized Physician Order Entry and Decision Support: Improving the Quality of Care," *Radio Graphics The Journal of Continuing Medical Education in Radiology*, vol. 21, pp. 1015-1018, July 2001.
- [33] D. W. Bates and A. A. Gawande, "Improving Safety with Information Technology," *N Engl J Med.*, vol. 38, pp. 2526-2534, 2003.
- [34] K. Fiumara *et al.*, "Chapter 7: Case Study on the Use of Health Care Technology to Improve Medication Safety," *Medication Use: A Systems Approach to Reducing Errors, Second Edition*, USA: Joint Commission resources, pp. 103-114, 2008.
- [35] W. Barron, "Improving the Quality and Safety of Care at Loyola University Health System," *American Medical Association Journal of Ethics*, vol. 6, no. 3, March 2004.
- [36] M. R. Ramaswamy *et al.*, "Accessing picture archiving and communication system text and image information through personal computers," *AJR Am J Roentgenol*, vol. 163, no. 5, pp. 1239-1243, Nov 1994.
- [37] A. Boonstra and M. Broekhuis, "Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions," *BMC Health Services Research*, vol. 10, no. 1, pp. 230, 2010.
- [38] Smelcer *et al.*, "Usability of Electronic Medical Records," *Journal of Usability Studies*, vol. 4, no. 2, pp. 70-84, 2009.
- [39] R. H. Miller and I. Sim, "Physicians' Use of Electronic Medical Records: Barriers and Solutions," *Health Affairs*, vol. 23, no. 2, pp. 116-126, 2004.
- [40] P. D. Clayton *et al.*, "Physician use of electronic medical records: Issues and successes with direct data entry and physician productivity," *MIA Annual Symposium Proceedings*, American Medical Informatics, pp. 141-145, 2005.
- [41] U. Tachinardi *et al.*, "Integrating Hospital Information Systems, the challenges and advantages of (re)starting now," *Proc Annu Symp Comput Appl Med Care*, pp. 84-87, 1994.
- [42] A. Ganesh and A. A. Mujaini, "Electronic Medical Record System: Have we Bitten off more than we can chew?" *Oman Med J.*, vol. 24, no. 1, pp. 1-3, January 2009.
- [43] K. A. Praveen and L. A. Gomes, "A study of the hospital information system (HIS) in the medical records department of a tertiary teaching hospital," *Journal of the Academy of Hospital Administration*, vol. 18, no. 1, 2006.
- [44] V. A. Ribière *et al.*, "Hospital information systems quality: A customer satisfaction assessment tool," *Thirty-Second Annual Hawaii International Conference on System Sciences*, 1999.
- [45] G. C. Moore and I. Benbasat, "Development of an instrument to measure the perceptions of adopting an information technology innovation," *Information Systems Research*, vol. 2, no. 3, pp. 192-222, 1991.
- [46] K. A. Kuhn and D. A. Giuse, "From hospital information systems to health information systems. Problems, challenges, perspectives," *Methods Inf Med.*, vol. 40, no. 4, pp. 275-87, 2001.
- [47] D. B. Meinert and D. Peterson, "Perceived importance of EMR functions and physician characteristics," *Journal of Systems and Information Technology*, vol. 11, no. 1, pp. 57-70, 2009.
- [48] P. Littlejohns *et al.*, "Evaluating computerised health information systems: hard lessons still to be learnt," *BMJ* 2003, vol. 326, no. 7394, pp. 860-863, 2003.
- [49] N. Zakaria *et al.*, "Exploring Security and Privacy Issues in Hospital Information System: An Information Boundary Theory Perspective," *AMIA Annu Symp Proc. 2003*, vol. 1059, 2003.
- [50] A. Budkin, "Implementation of Hospital Information systems," *Proceedings of the SIGBIO symposium on health computing careers*, vol. 5, no. SI, 1991.
- [51] M. L. Houser *et al.*, "The implementation of Hospital Information system- Change, challenge and Commitment," *Proc Annu Symp Comput Appl Med Care*, pp. 221-224, 1984.
- [52] L. Rossi *et al.*, "Design and implementation of a hospital information system for the Palestine Red Crescent Society in Lebanon," *La Revue de Sant é de la Méditerranée orientale*, vol. 15, no. 3, pp. 738-746, 2009
- [53] G. Hassan, "Managing A Multiple Hospital HIS Implementation Project," *E-Health Asia Conference*, Kuala Lumpur, 6th-8th April 2004.
- [54] N. B. A. Hamid, "Accessibility Hospital Information System – Malaysian Experience," *30th International Seminar for Public Health Group (PHG) of the Union of International Architectes (UIA)*, Kuala Lumpur Convention Centre: Kuala Lumpur, Malaysia, 20 November-1 December 2010.
- [55] A. Ismail *et al.*, "The Implementation of Hospital of Hospital System (HIS) in Tertiary Hospitals in Malaysia: A Qualitative Study," *Malaysian Journal of Public Health Medicine 2010*, vol. 10, no. 2, pp. 16-24, 2010.
- [56] A. B. Suleiman, "E Health in Health Development in Malaysia," *HIMSS AsiaPac08 Conference & Exhibition*, Convention & Exhibition Centre, Hong Kong, 2008.
- [57] R. Yin, *Case Study Research: Theory, Methods, Practice (4 ed.)*, Emerald Group Publishing, Woodside, A. G., 2010.
- [58] S. B. Merriam, *Qualitative Research And Case Study Applications in Education*, San Francisco, Jossey-Bass, 2001
- [59] S. Kvale, *Interviews: An Introduction to Qualitative Interviewing*, London, SAGE, 1996



Nurul Izzatty Ismail is a Ph.D. student at Department of Technology Management, Universiti Tun Hussein Onn Johor, Malaysia. She graduated in Science of Information Management from the Universiti Teknologi MARA Segamat and Universiti of Teknologi MARA Puncak Perdana, Malaysia. She is interested in social science researches.



Nor Hazana Abdullah is currently lecturer at the Department of Technology Management, Universiti Tun Hussein Johor, Malaysia. She is a graduate of the Indiana University of Bloomington, Universiti Teknologi Malaysia and Universiti Tun Hussein Onn Johor, Malaysia. She is currently Head of the Department of Technology Management and interested in social science researches.



Alina Shamsudin is currently associate professor at the Department of Technology Management, Universiti Tun Hussein Johor, Malaysia. She is a graduate of the University Teknologi Malaysia and University of Strachlyde. She is interested in social science researches.



Nik Azliza Nik Ariffin is a senior lecturer in Records Management and Information System at the Faculty of Information Management at University Technology MARA (UiTM). She is currently pursuing her study in PhD and mainly specializes in Electronic Medical Records Management System. She is a graduate of the International Islamic University Malaysia and University Technology MARA (UiTM). Her research interests are in the areas of electronic records management, health information management, records management and medical records management.