

<http://www.cisjournal.org>

Challenges of Implementing HealthCare Information Systems in Developing Countries: Using a Mixed Method Research

Hussein M. Al-Yaseen

Management Information Systems Department, Faculty of Administrative and Financial Sciences

Al-Ahliyya Amman University, Amman, Jordan

hyaseen@ammanu.edu.jo

ABSTRACT

Implementing information systems (IS) successfully in organizations appears to be a complex task and healthcare information systems are no exception. Healthcare organizations have expressed concerns about the value they are getting from their HealthCare Information Systems (HCIS), and they have been searching for ways to estimate/evaluate and justify these projects. Accordingly, valuing of HCIS therefore becoming an important issue for both managers and practitioners. HCIS evaluation aims to investigate the current practice of both two types of evaluation: Prior Operational Use evaluation (POUe) and Operational Use evaluation (OUe) in Jordanian private hospitals to better understand what is required for the evaluation process and its associated benefits; secondly, to collect information about how hospitals carry out the evaluation process. In doing so, the research attempts to answer specific questions, such as: How prevalent is POUe and OUe? What criteria are being used in both types of evaluation? What are the main benefits and uses of each type of evaluation? Findings suggest that most decision makers do not lay much importance to OUe of their healthcare IS projects, and tend to think of it only as a formality rather than a proper evaluation process. Without adopting a formal OUe the cost of future health informatics would seem likely to be less accurately estimated and more typical disappointments faced by managers and owners.

Keywords: *Healthcare information systems, mixed research method, evaluation, developing countries, Jordan.*

1. INTRODUCTION

Many organizations in developed and developing countries -in both private and public sectors- turned to Information Systems (IS) to meet the increasing demands to increase their efficiency and effectiveness [18]; [19]; [23]; [36]; [16]; [9]; [3]; [4]; [5]; [31].

Organizations specialized in healthcare are no exception as they have also joined in building their systems that also require investments in IS [34]. These systems are known as healthcare information systems (HCIS) which focus on optimizing and using information to increase efficiency and effectiveness in healthcare sectors [30]; [14]; [26].

Such a continuous increase in IS investment coupled by continuous need for justification presents a challenge to the IS community. Many organizations reported that they are uncertain about how to measure (evaluate) the impact and the outcomes of their IS investments [7]; [9]; [10]; [12]; [21]; [22]; [32]; [13]; [2].

This paper investigates the evaluation process of health information systems implemented in Jordanian private hospitals and explores the main issues related to the evaluation process. The research is organized as follows: First, an introduction about the importance of IS in healthcare sector. Second, a discussion about systems evaluation, the need for justification and the evaluation types. Fourth, details of the research approach used are presented. Fifth, a preliminary findings from phase one

(quantitative) and phase two (qualitative) and Finally, conclusions, recommendations and limitations of this research.

2. LITERATURE REVIEW: JUSTIFICATION AND IS EVALUATION TYPES

Justifying expenditure on IS is a long standing problem, and managers for the past few decades have expressed concerns about the value they are getting from IS investments; moreover they have been searching for ways to evaluate and justify the use of IS [2]; [5]; [20].

Evaluation can be defined as: the 'process of establishing by quantitative and/or qualitative techniques the worth of IS projects to the organizations' [35]; or 'to judge or determine the significance, worth, or quality' (Webster's Dictionary); the process of assessing the worth of something [6].

Evaluation can be classified into two types with regards to the timing of evaluation [9]. Type A is a Prior Operational Use Evaluation; sometimes referred to as ex-ante; formative, or Prior-Implementation Evaluation; or as we shall refer to it, 'Prior Operational Use evaluation' (POUe). POUe is a 'predictive' evaluation performed to forecast the impact of the project. This type of evaluation is carried out prior the system becomes into operational use -through the development stages of IS- to justify the investment. Type B of evaluation is carried out when the system becomes into operational use; this form of evaluation draws on real rather than projected data, and can be used to justify adoption [24]; [15]; estimate the

direct cost of the system, estimate the tangible benefits of the system [22]; ensure that the system meets requirements [15]; measure the system effectiveness and efficiency [28]; measure the quality of programs and to estimate indirect costs and other costs [24]; or to measure the quality of programmes [9]. We shall refer to this type as 'Operational Use evaluation' (OUe). Figure 1 shows these forms of evaluation with respect to the system's life cycle from a system's inception to the end of its useful life.

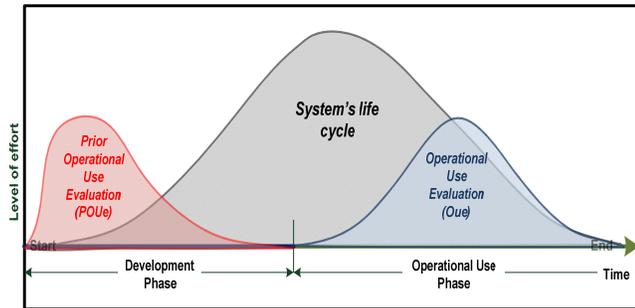


Fig 1: IS evaluation types in the healthcare information systems' life cycle

3. STUDY DESIGN AND METHODOLOGY

In order to gather as much information as possible to understand the whole picture about the procedure of adopting both types of evaluation in healthcare information systems; this research follows a phased approach to the empirical study – namely two phases. By using different sources and methods at various points throughout the research, it can be build on the strength of each type of data collection and minimize the weaknesses of any single approach. A multi-method approach to evaluation research can increase both the validity and reliability of evaluation data. The validity of results can be strengthened by using more than one method to study the same phenomenon. The main purpose of the second phase is to capture the remaining issues that were missed in the first phase [17], [33].

Phase one of this research required a certain types of data to be gathered to answer the research questions (e.g. how prevalent are POUe and OUe of healthcare information systems). This kind of research question needs a high rate of respondents in order to generalize the finding. In phase one, a wide range of data sources were used, which include:

- General information on healthcare systems in Jordan (Government websites such as [25]; [29].
- Data from a survey: we administered a survey instrument to all private hospitals. Questionnaire contains four stages (see Appendix 1): designing and testing the

questionnaire; followed by data collection and then data analysis; and finally the preliminary findings of the questionnaire. The survey was sent to all private hospitals (60 private hospitals); data were collected over the period of April to June 2010 in Jordan.

We analyzed the data from the responses of the questionnaire using a combination of the parametric statistical methods, Descriptive Analysis and Factor Analysis [27].

Primary data collection for the second phase consisted of four formal semi-structured interviews over the period of May to June 2011; interviews were conducted with the manager of the hospital and the manager of IS department in both hospitals; researcher was prohibited from using a recording device and those interviewed remain anonymous (Hospital_A and Hospital_B).

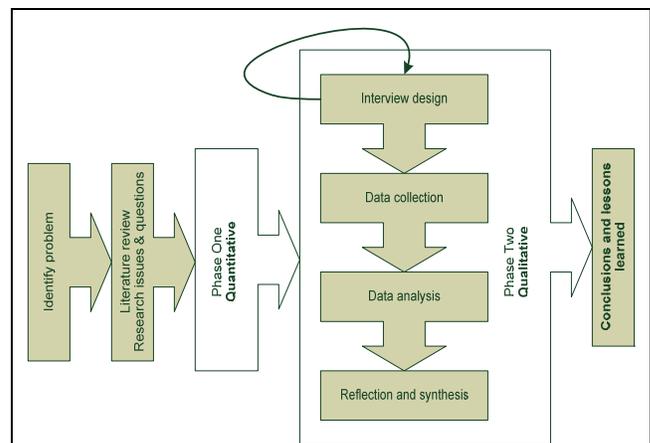


Fig 2: Research design and phases

4. A BRIEF FINDINGS FROM PHASE ONE (QUANTITATIVE)

This section presents aggregated results from direct answers to the research questions mentioned above. The basic issues considered here are: reasons for adopting either type of evaluations, criteria used for evaluations, and uses and benefits of adopting the two types of evaluation of healthcare systems.

Of the 60 questionnaires addressed to all private hospitals, 19 completed questionnaires were returned for a total response rate of 31.7%. The average IS costs for the private hospitals in the research sample is (\$328,000); while within the sample, 15% (9 hospitals) had implemented systems that cost more than (\$1,140,000). 26.7% (16 hospitals) of the respondent hospitals have adopted IS as a response to problem(s), while 73.3% (44 hospitals) of the respondent hospitals have adopted IS

<http://www.cisjournal.org>

systems searching for ways of improving their efficiency and effectiveness (see [1]).

5. PHASE TWO (QUALITATIVE)

Findings of phase one gave some insight into the percentage of hospitals that adopt OUE (OUE) and for what purposes. The aim of phase two is to explore in further detail within those hospitals that carry out OUE, why and how such hospitals go about it in order to better understand what is required for the evaluation process. In doing so there is an attempt to answer specific questions: Who is involved in the evaluation process? What criteria are being used for OUE? What are the most important barriers obstructing the adoption of OUE? Further, this phase attempts to clarify the gap between the outcomes of POUE and OUE and its causes. Based on the findings from phase one it was evident that not many hospitals conduct OUE. Further, some of the hospitals do not know much about it.

6. CASE ONE: HOSPITAL_A:

For the purpose of this research 'Hospital_A' will be used to refer to the first hospital being studied. Hospital_A is a private hospital which has 300 full time employees and around 100 visiting doctors. It is engaged in providing a wide range of healthcare services. Hospital_A has a main IT department which organizes and manages all healthcare sub-systems which include: (patient database, pharmacy subsystem, doctors database, employees database, financial sub-system...etc.); all these sub-systems were independent.

6.1 The Current Sub-Systems: Preliminary Evaluation

The hospital manager has received an official demand from the users stated that the hospital has to establish a new proper system due to a lot of problems in the current system and to keep base with the continuous development. The general manager asked the public relation department manager (the son of the manager) to establish a team its responsibility is to evaluate the current sub-systems in terms of efficiency and effectiveness and to suggest an applicable solution within a month. The team stated that 'the reasons for adopting prior operational use evaluation (POUE) is to justify the adoption of the new system to the hospital manger; to report about the system performance -the effectiveness and efficiency-; and to ensure that the new system will meet the anticipated requirements; however, we did not pay much attention to the issue of cost side... we do not have an experience in evaluating such systems and we do not know any formal evaluation method, further, there were lack on agreement on the evaluation criteria; in other words, what to evaluate and how to evaluate...'; however, they evaluate the sub-systems based on their historical and the usage experience.

6.2 Initiation and planning phases of the new system

The two teams started to set the main healthcare system's requirements by outlining all healthcare system's

tasks and identifying the resources (people, hardware, software, and services) in order to prepare the schedule plans and spending plan. Apparently, the hospital team lack of experience in understanding the healthcare system's requirements as one of the hospital team mentioned: 'when we have been asked for what we are expecting from the healthcare system to do? We asked for a complete, fast, consistent, advanced system with a developed hardware'. At the end of planning phase, the project plan consists of the main estimation sides of the healthcare system such as: scheduled plans and spending plan as shown in Table 1.

Table 1: Scheduled plan and spending plan and the deviation of healthcare system

Project phase	Estimated duration (month)	Estimated cost (1000 J.D)	Deviation in scheduled plan (month)	Deviation in spending plan (1000 J.D)
Initiation	0.5	5	-	-
Planning	1.5	15	-	-
Executing	7	550	1	110
Close down	2	80	1	40
Total	11	650	2	150

6.3 Implementation and closing down the new system

IT Company went through the implementation phase of the system and the hospital team was involved in monitoring the performance of implementing the system against the system's plan. After producing many deliverables from the system, the hospital team became more aware and gained experience in the specifications of the system and that direct them to inquire more functions from the IT Company. IT Company realized that the change requests from the employees will cause a deviation in both (scheduled plans and spending plan) as shown in Table 1.

6.4 Operational use phase

The hospital team and the developers conducted a review process (formal OUE) of the healthcare system. The review process took less than 3 months. According to the team the most important benefits and uses of OUE were (to verify that installed system meets system requirements, close out the system development project, to justify adoption, and mainly to transfer responsibility from developers to users, and Report on system effectiveness to management). Whereas, evaluation of system development project and provide feedback for modification to development methods; measuring benefits and costs, measuring system's risks and barriers were less important benefits and uses of OUE.

6.5 The gap between estimation and potential outcomes:

Budgeted cost of the work scheduled (BCWS) of the project was (650000 J.D) and the duration was (11 months) as shown in Figure 3. The outcomes of the operational use evaluation showed that there is a gap between project plan (at the beginning of the project) and the actual plan. The gap consist of two main factors, a deviation the scheduled plan and an overruns in spending plan as the system cost (800000 J.D which is the actual cost of the work performed ACWP (150000 J.D over budget –cost variance –CV-); however, in terms of the system's specifications, the hospital manager stated that the system met its anticipated requirements in a good quality and with all the modification.

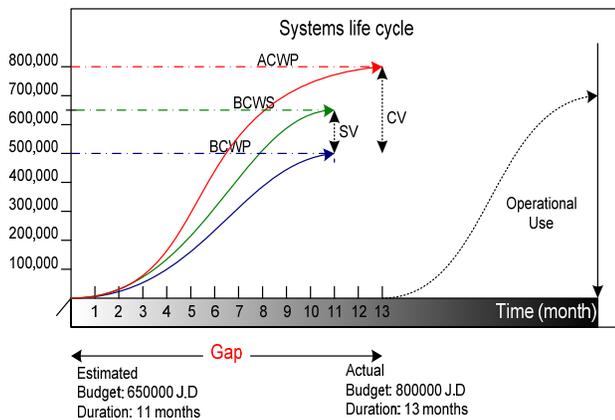


Fig 3: The gap between estimation and actual system's costs and duration

7. CASE TWO: HOSPITAL_B

For the purpose of this research, 'Hospital_B' will be used to refer to hospital two being studied. Hospital_B is a private hospital. It has 230 full time employees and around 70 visiting doctors. It is engaged in providing a wide range variety of healthcare services. Hospital_B has a main computer department, which responsible for managing all tasks of healthcare sub-systems.

The subsystems in Hospital_B have many problems, as the hospital manager confirmed 'we have major issues in reliability, the data is not consistent and there is no integrity, sometimes the data is inaccurate and all the hardware needs upgrade. The manager of Hospital_B collected information about the system and recommended to the owner to purchase a copy of the same system; after negotiation and because of the owner of Hospital_B is an investor; he decided to buy IT company to compete and for investment purposes.

7.1 Prior Operational Use and Operational Use evaluation at Hospital_B:

According to Hospital_B manger: 'we have bought the IT Company for 1 million J.D; we get the system for free; also I think we will market the system to other at least 4 to 5 hospitals and that will be a good investment'. Because Hospital_B bought the system ready to use they did not conduct any type of prior implementation evaluation to the system; however they (hospital manger and users from different department in the hospital) reviewed the system in terms of functionality and there are lack of agreement on the evaluation criteria, though they did some change to improve its performance.

The review process (formal OUE) took around 7 months. As mentioned above, the reviewer focused on the information quality of the system such as: accuracy of information, adequacy of information, appropriateness of information, however, scheduled plans is from the least important OUE criteria as one of the reviewer said 'we are not in a hurry, we have enough time to review the system as we own the IT company'. The reviewer of the system declared that there were some obstructions of conducting formal OUE from these are 'we have lack of awareness on the OUE criteria and method, also, OUE will cost us too much as we do not have a qualified evaluator in the hospital or in the IT company. OUE will distract us from other work in the hospital; furthermore we have already bought the system so we have to use it and to market it'.

On the other hand, the main reviewer pointed out about the main uses and benefits of using or conducting a formal OUE as 'from my point of view OUE is very important, the most important uses and benefits are: in order to justify the investment and the adoption of the system, also, for continuation or termination of installed system; to report on the system's effectiveness and efficiency to sponsors and management; to verify of economic payoff of the system, measuring system's benefits (tangible and intangible). However, the least important uses and benefits of conducting formal OUE in our hospital are: to measure the cost side which include (expenses saved, reduction in other staff salaries, and unexpected costs), and to transfer responsibility from system's developers to users as the hospital and developers are in the same side'.

7.2 The gap between estimation and potential outcomes at Hospital_B:

The healthcare system at Hospital_B is operational for the last 2 years. When investigate the current situation of the systems in terms of its planned objectives. The manager of IT department at Hospital_B declared that 'we did not conduct any type of formal evaluation after the first time we installed the system; however, I can say that there is a deviation or unexpected outcomes from the systems in terms different criteria or

<http://www.cisjournal.org>

factors. Firstly, we were expecting we will market the system as the owner expect to at least 4 to 5 hospitals; though, we did not sell any copy of the system and this was a big issue as the system cost us around 1 million J.D, and this is the first deviation (gap) in the cost side. Secondly, in terms of the system's benefits, it is cleared that the system is efficient and effective, yet, it is difficult to measure the real benefits from it (quantitatively or qualitatively) since most of the system's benefits are intangible and this type of benefits are difficult to be measured. Thirdly, after using the system for a while it is difficult to make any improvements or modifications as most of the developers in the IT company which the hospital owned were left'.

8. CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

Based on a sample of Jordanian healthcare systems in a private hospitals, this paper has examined how prevalent both types of evaluation POUE and OUE of healthcare systems in private hospitals in Jordan, the criteria are being used in order to evaluate healthcare systems, as well as the main uses and benefits of adopting both types of evaluation –POUE and OUE-.

The results of the analysis have shown that most hospitals attach great importance to the measuring of benefits rather than the issue of costs. Furthermore, most decision makers do not place much importance on OUE of their healthcare systems and most managers tend to think of it only as a formality rather than a proper evaluation process as shown in case one and case two.

As shown in case two, it is clear that the practitioners are not appreciating the full benefits of OUE and need to be aware of such benefits. Such lack of appreciation is evidently behind the apparent shortage of implementations of OUE, which negatively feeds back into awareness of both types of evaluation.

From the analysis of the two cases (Hospital_A and Hospital_B), we can conclude a proposed recommendation to the public healthcare sector and other private hospitals who are planning to successfully implementing healthcare information system.

Evaluation process is a fundamental and critical activity and needs to be thoroughly conducted in any phase of the system's life cycle [11]. Furthermore, it is increasingly acknowledge that evaluation of information systems is recognized as a complex and challenging activity, and there is no agreement on an ideal way to evaluate or how to make the evaluation process better [8].

Accordingly, without adopting a formal OUE the cost of future health informatics would seem likely to be less accurately estimated and evaluated. The results of this

research confirms that diffusion of the importance of OUE amongst both the academic and practitioners' communities could play an important role in more healthcare information systems effectiveness and less disappointment and less systems failure. We hope the reader agrees, in which case this paper has made such a contribution.

This research focuses on the private sector of hospitals but it does not include any information about the public sector. Private hospitals in Jordan are more developed in terms of using IS than the public healthcare organizations which suffer from lack of resources. The results of OUE in private hospitals, if and when it is carried out could be useful for public healthcare organizations. In a developing country like Jordan which has limited resources, the lessons learnt from the implementation of information systems and the deviations that occur in such systems could be useful in estimating the budgets required for the implementation of such systems in the public sector, given the limited resources available for such organizations. It is understandable that the scope of systems for public healthcare is different; nonetheless, the results of OUE of systems in the private sector could still be useful for decision makers.

REFERENCES

- [1] H. Al-Yaseen, S. Al-Jaghoub, M. Al-Shorbaji, and M. Salim, M. "Post-Implementation Evaluation of HealthCare Information Systems in Developing Countries", *The Electronic Journal Information Systems Evaluation*, Vol. 13, No. 1, Pp. 9 - 16, 2010.
- [2] H. Al-Yaseen, A. Al-Gweri and S. Al-Jaghoub "IS/IT Investment Appraisal: Prior and Post Implementation Evaluation in Jordanian Firms", *International Conference Applied Computing (IADIS)*, Spain, 2007.
- [3] H. Al-Yaseen, T. Eldabi, D. Lees and R. Paul "Operational Use Evaluation of IT Investments: An Investigation into Potential Benefits", *European Journal of Operational Research (EJOR)*, Vol. 173, No. 3, Pp. 1000-1011, 2006.
- [4] H. Al-Yaseen, T. Eldabi and R. Paul "A quantitative assessment of operational use evaluation of information technology: benefits and barriers", *Proceedings of the Tenth Americas Conference on Information Systems (AMCIS)*, New York, Pp. 688 – 692, 2004.
- [5] H. Al-Yaseen, T. Eldabi, R. Paul and R. El-Haddadeh, R. "Post-implementation evaluation of IT systems: A close review of practice". In Irani, Z. and Love, P. (2008) *Evaluating Information*

<http://www.cisjournal.org>

- Systems: Public and Private Sector, Butterworth-Heinemann, Oxford, UK, 2008.
- [6] P. Beynon-Davies, I. Owens and M. Lloyd-Williams “IS Failure, evaluation and organisational learning”, UKAIS, Cardiff, Pp. 444 – 452, 2000.
- [7] M. Bradford and J. Florin “Examining the role of innovation diffusion factors on the implementation success of enterprise resources planning systems”, International Journal of Accounting Information systems, Issue 4, Pp. 205 – 225, 2003.
- [8] E. K. Dabrowska and T. Cornford “Evaluation and Telehealth – an Interpretative Study”. Proceedings of the Thirty-Fourth Annual Hawaii International Conference on System Sciences (HICSS)-34, Maui, Hawaii, Computer Society Press of the IEEE. Piscataway, N.J., June 2001.
- [9] T. Eldabi, R. Paul and H. Al-Yaseen, H. “Operational use evaluation / post implementation evaluation of IT”, UKAIS, Warwick, UK, 2003.
- [10] B. Farbey, F. Land. And D. Targett, D. “How to assess your IT investment: a study of methods and practice”, Butterworth-Heinemann Ltd., London, 1993.
- [11] G. H. Galal, J. T. McDonnell and R. Paul, R. J. “The Role of Interpretative Evaluation in Engineering Information Systems Requirements”. Proceedings of the Americas Conference on Information Systems (AMCIS) (10-13 August, Long Beach, Ca.), Editor: Chung, H. M., Association for Information Systems, Atlanta, Pp. 1102-1108, 2000.
- [12] A. Gunasekaran, P. E. D. Love, F. Rahimi and R. Miele “A Model for Investment Justification in Information Technology Projects”, International Journal of Information Management, Vol. 21, Pp. 349 – 364, 2001.
- [13] A. Gunasakeran, E. W. T. Ngai, R. E. McGaughey “Information technology and systems justification: A review for research and application”, European Journal of Operational Research, Vol. 173, Pp. 957-983, 2006.
- [14] K. Hayrinen, K. Saranto and P. Nykanen “Definition, structure, content, use and impacts of electronic health records: A review of the research literature”, International Journal of Medical Informatics, Vol. 77, No. 5, Pp. 291-304, 2007.
- [15] Z. Irani “Information systems evaluation: navigating through the problem domain”, International Journal of Information and Management, Vol. 40, Pp. 11 – 24, 2002.
- [16] Z. Irani, A. Sharif, P. E. D. Love and C. Kahraman “Applying concepts of fuzzy cognitive mapping to model: The IT/IS investment evaluation process”, International Journal of Production Economics, Issue 75, Pp. 199 – 211, 2002.
- [17] R. Johnson and A. Onwuegbuzie “Mixed Methods Research: A Research Paradigm Whose Time Has Come”, Educational Researcher, Vol. 33, No. 7, Pp. 14–26, 2004.
- [18] S. Jones and J. Hughes “Understanding IS Evaluation as a Complex Social Process”. Proceedings of the 2000 Americas Conference on Information Systems (AMCIS) (10-13 August, Long Beach, Ca.), Editor: Chung, H. M., Association for Information Systems, Atlanta, Pp. 1123 – 1127, 2000.
- [19] A. Keszthelyi “How to Measure an Information System’s Efficiency”, MEB 2009, 7th International Conference on Management, Enterprise and Benchmarking, Budapest, Hungary, 2009.
- [20] K. Kumar “Post Implementation Evaluation of Computer Information Systems: Current Practices”. Communications of the Association for Computer Machinery (ACM), Vol. 33, No. 2, N.Y., (January), Pp. 203 – 212. 1990.
- [21] C. Lin and G. Pervan “The practice of IS/IT benefits management in large Australian organisations, International Journal of Information and Management, Issue 41, Pp. 13 – 24, 2003.
- [22] Y. Liu, F. Yu, S. Y. W. Su and H. Lam “A Cost-Benefit Evaluation Server for decision support in e-business”, Journal of Decision Support Systems, Issue 36, Pp. 81 – 97, 2003.
- [23] D. Litan, M. Velicanu, L. Copcea (Teohari), M. Teohari, A. M. Mocanu (Virgolici), I. Surugiu and O. Raduta “Achieving the Efficiency for Information Systems - Possibilities and Prospects”, International Journal of Applied Mathematics and Informatics, Issue 3, Vol. 5, Pp. 165-179, 2011.
- [24] P. E. D. Love and Z. Irani “Evaluation of IT costs in construction”, Journal of Automation in Construction, Vol. 10, Pp. 649 – 658, 2001.

<http://www.cisjournal.org>

[25] Ministry of Health (MoH) Jordan, www.moh.gov.jo/MOH/En/home.php, (Accessed March, 2011).

[26] OECD, Health care systems: Getting more value for money, OECD Economics Department Policy Notes, No. 2, 2010.

[27] M. A. Pett, N. R. Lackey and J. J. Sullivan “Making sense of factor analysis: the use of factor analysis for instrument development in health care research”, Sage Publications, London, 2003.

[28] P. Poon, P. and C. Wagner “Critical success factors revisited: success and failure cases of information systems for senior executives”, Journal of Decision Support Systems, Vol. 30, Pp. 393 – 418, 2001.

[29] Private Hospitals Association (PHA) Jordan, www.pha-jo.com, (Accessed March, 2011).

[30] P. L. Reichertz “Hospital information systems – Past, present, future”, International Journal of Medical Informatics, Vol. 75, No. 3-4, Pp. 282-299, 2006.

[31] D. Remenyi, A. Money, M. Sherwood-Smith and Z. Irani “The effective management and management of IT costs and benefits”, Butterworth-Heinemann Ltd., London, 2000.

[32] W. Skok, A. Kophamel and I. Richardson “Diagnosing information systems success: importance-performance maps in the health club industry”, International Journal of Information and Management, Issue 38, Pp. 409 – 419, 2001.

[33] A. Tashakkori and C. Teddlie “The past and the future of mixed methods research: from Methodological Triangulation to Mixed Methods Designs”. In Handbook of Mixed Methods in Social and Behavioral Research, Tashakkori and Teddlie (Eds.). Thousand Oaks, CA: Sage, 2003.

[34] T. Wetter “To decay is system: The challenges of keeping a health information system alive”, International Journal of Medical Informatics, Vol. 76, Pp. 252 – 260, 2007.

[35] L. Willcocks “Evaluating information technology investments, research findings and reappraisal”, Journal of Information Systems, Vol.2, Pp. 243 – 268, 1992.

[36] L. Willcocks and S. Lester “Beyond the IT Productivity Paradox”, Wiley, Chichester, 1999.

APPENDIX A: QUESTIONNAIRE

Organisation background

IT infrastructure information

Prior Operational Use evaluation Involvement in Prior Operational Use evaluation in healthcare system

Group	Feasibility	Design	Implementation	Testing
User department				
Customers department				
IT department				
Internal audit				
External audit				
Project team				
System department manager				

Determining Prior operational use method and criteria

Group	Determined evaluation method	Determined evaluation criteria
User department		
Customers department		
IT department		
Internal audit		
External audit		
Project team		
System department manager		

Reasons for adopting Prior Operational Use evaluation

Reason	Rank (0-9)
Justify adoption	
System effectiveness	
System efficiency	
System meets requirements	
System performance	
Tangible benefits	
Direct costs	
Indirect costs	
System security	
System usage	
Hardware performance	
Intangible benefits	

<http://www.cisjournal.org>

Maintenance costs	
Operational costs	
Other costs	
Other expenses saved	
Quality of programs	
Other benefits	
Quality and completeness of system documentation	
Reduction in clerical salaries	
Reduction in other staff costs	
Training costs	
Upgrade costs	
Barriers of adopting the system	

Quality and completeness of system documentation	
Net operating costs (saving of system)	
Appropriateness of information	
Adequacy of information	
Hardware performance	

**Operational Use evaluation
Involvement in and determining operational use
evaluation method and criteria**

Group	Involvement in evaluation process	Determined evaluation method	Determined evaluation criteria
User department			
Customers department			
IT department			
Internal audit			
External audit			
Project team			
System department manager			

Barriers to Operational Use evaluation

Barrier	Rank (0-9)
Unavailability of users to spend time on evaluation activities	
Availability of qualified evaluator	
Operational Use evaluation is too difficult	
The lack of an appropriate method of Operational Use evaluation	
The lack of an agreement on criteria of Operational Use evaluation	
It distract from other work	
May the results would be used in a negative way	
It costs too much	
It is not necessary	

Operational Use evaluation criteria

Factor	Rank (0-9)
System's impacts on users and their jobs	
System's fit with the impact upon organisation	
System performance versus specifications	
Quality of programs	
Project schedule	
Internal control	
Accuracy of information	
User satisfaction and attitude towards system	
System usage	
User friendliness of system-user interface	
Timeliness and currency of information	
System security and disaster protection	

Benefits and uses of Operational Use evaluation

Benefits and uses	Rank (0-9)
Verification that installed system meets system requirements	
Provide feedback for modification to project-management method	
Clarify and set Priorities for needed modifications to installed system	
Close out the system development project	
evaluation of system development project personnel	
Justify adoption, continuation, or termination of installed system	
Report on system effectiveness to management	
evaluation and refinement of system controls	
Verification of economic payoff of system	
Estimates of operational costs	
Estimates of training costs	
Estimates of maintenance costs	
Estimates of upgrades costs	
Provide feedback to system development personnel	
Transfer responsibility for system from developers to users	
Provide feedback for modification to	

<http://www.cisjournal.org>

development methods	
Reduction in clerical salaries	
Reduction in other staff costs	
Other expenses saved	

Reasons for adopting Operational Use evaluation

Factor	Rank (0-9)
Tangible benefits	
Justify system adoption	
Other benefits	
Indirect costs	
Estimating of system life	
Direct costs	
Other costs	
Risks	
Barriers	
Intangible benefits	
Move responsibility to users	