

# Successful Implementation Of Integrated Ealth Information Systems: The Role And Impact Of Business Process Management

Dr. Abdullah S. Al-Mudimigh

**Abstract**—These instructions give you guidelines for preparing papers for the International Journal of Computer Theory and Engineering (IJCTE). Use this document as a template if you are using Microsoft Word 6.0 or later. Otherwise, use this document as an instruction set. The electronic file of your paper will be formatted further at International Journal of Computer Theory and Engineering. Define all symbols used in the abstract. Do not cite references in the abstract. Do not delete the blank line immediately above the abstract; it sets the footnote at the bottom of this column.

**Index Terms**—About four key words or phrases in alphabetical order, separated by commas.

## I. INTRODUCTION

Integrated Health Information Systems (HIS) software packages (synonyms are hospital information systems, health information management, clinical information systems, healthcare information systems, health information technology, and health application systems) seek to integrate the complete range of a health departments' processes and functions in order to present a holistic view of the health care from a single information and IT architecture.

The recent push for healthcare reform has caused health departments to focus on ways to streamline their processes in order to deliver high quality care while at the same time reducing costs. On the other words, health departments increasingly recognize the value of sharing information among all stakeholders. Integrated HIS packages have made a tremendous contribution to the world of health care[12]. Indeed, the value that HIS packages can bring to health sectors is clear to many health organizations, and few will dispute its potential. However, there are also hazards associated with implementation of integrated HIS. Their failure is high and may cause negative effects on staff and patients [1, 2, 11]. These software packages are huge and complex systems and warrant careful plan and execution to ensure successful implementation. In other words, integrated HIS implementation is much more than implementation of hardware or software systems; they affect how a health care conducts itself.

Department of Information System, College of Computer and Information Sciences, King Saud University, Riyadh, Kingdom of Saudi Arabia, Riyadh 11543, P O Box 51178, Saudi Arabia

Few health care sectors will dispute the value that HIS software can bring to their business. However, most health organizations are not putting in place the procedures to manage the changes and customizations they need to make to HIS for establishing better services to their patients and staff. Most health sectors are too busy building and running the technical aspects of their HIS package to recognize the need, and long-term value, of change and business process management. This value extends well beyond application development, and, in fact, provides the backbone for successful installations and operation of an HIS.

The success of an integrated HIS implementation has often been attributed to two facts; the HIS package is configured and running, and the whole project is (more or less) on time and within budget (Rosemann and Wises, 1999). However, this is a narrow view of HIS implementation focusing on the hard aspects and reducing it to a mere software or IT project. Health care are becoming engrossed in building and running the technical aspects of their HIS to recognize the need, and long-term value, of change and business process management. Integrated HIS is the umbrella for integrating sets of health departments applications that allow them to manage almost all aspects of operations. The value of this holistic view extends well beyond application development, and, in fact, provides the backbone for successful installations and operation of an integrated HIS software package. Many integrated software implementation failures have been due to the lack of focus on 'the soft issues', i.e. the business process and change management [5, 14]. The role and impact of business process management (BPM) in successful integrated HIS implementation is crucial, and is the subject of our investigation here.

## II. INTEGRATED HIS CRITICAL SUCCESS FACTORS

Due to the complex and integrated nature of HIS software package, the large investments involved (time and money), and the relatively high implementation failure rates[1, 2, 3]. it is imperative for health care sectors to study the experiences of others, and learn from their practices and success factors.

A literature review was conducted to understand the critical success factors in successful integrated software implementation [17]. The review covered numerous published books and articles. The review concluded the identified CSFs fall under one of four main categories, namely: executive leadership, changing of the existing processes, deploying change management, and the IT infrastructure. These CSF categories are presented in Figure

1.

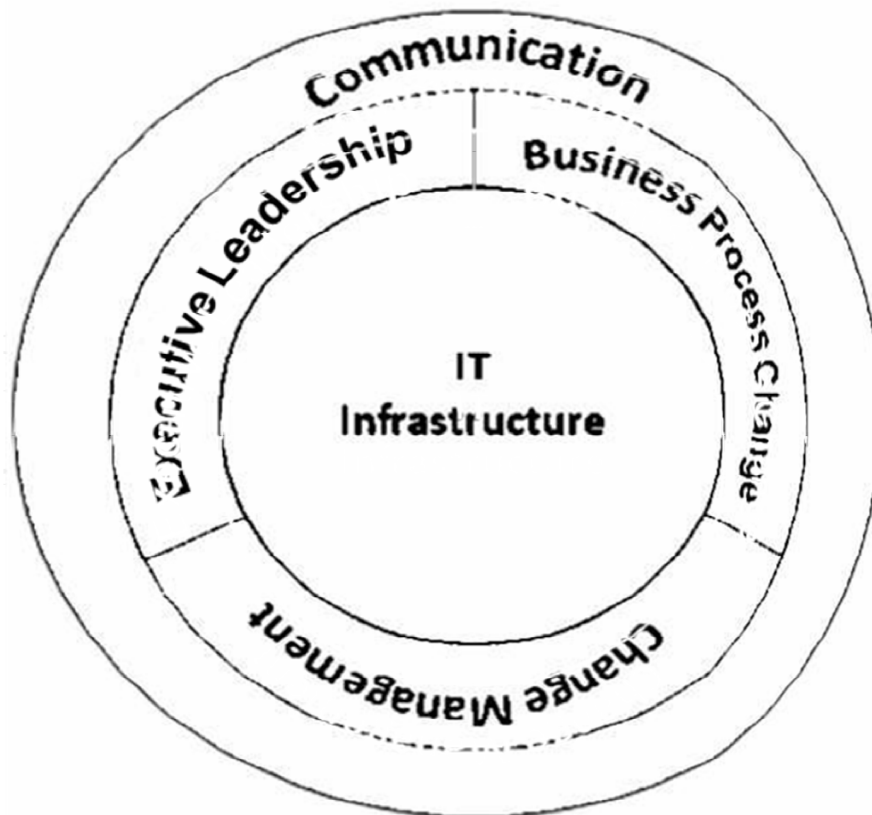


Figure 1: CSF Categories for successful integrated HIS

The following is a brief overview of each of these categories:

**Executive Leadership:** Executive must be a part of integrated HIS implementations. The leadership is a high level official who works for institutionalization of the project, is a talent and good communicator, and has political awareness and influential contacts. The IT literatures have clearly demonstrated that for IT projects to succeed executive support is critical. However, executive in many health care sectors still view the installation of an integrated HIS as primarily a technological challenge and assign its responsibility to the IT departments. This is seen as a risky act due to HIS's profound health care implications.

2). **Business Process Change (BPC):** Implementing an Integrated HIS package involves changing the existing business processes to the best business process standard.

Integrated HIS was built on best practices that are followed in the health care sectors, and to successfully install HIS package, all the processes in a health departments must conform to the HIS package.

During the HIS preparation phase, health care sectors face a question as to whether to implement the HIS software "AS IS" or modify the product to the specific needs of their requirements. Indeed, it has been recommended by practitioners and expert people that a hospital has to change its processes to conform to the integrated HIS package. In fact, this need to change the hospital's business processes is communication, and networking infrastructure is required for HIS application. Integrated HIS can't be without

seen as one of HIS's major benefits.

3). **Change management:** One of the main obstacles facing integrated HIS implementation is resistance to change. There will be resistance from users (for instance, from nurses, phlebotomists other paramedical staff, etc) who may feel that feeding information into the computerized system is additional work and not their primary responsibility or core competence. "Health care constantly evolving. Wave after wave of new technologies, insurance model, information systems, regulatory changes, and institutional arrangements buffet the system and the people in it. But people and institutions, for the most part, do not like change. It is painful, difficult and uncertain" [2]. To successfully implement integrated HIS package, the way health departments do business will need to change and the ways people do their jobs will need to change too. Its success is largely dependent on the commitment of health management, IT staff, and program staff to implementing integrated HIS that will change the way they do their jobs [9]. Thus, change management is essential for preparing a company for the introduction of a HIS, and its successful implementation. However, change management has to be structured within an overall Business Process Management methodology to achieve its goals.

4). **IT Infrastructure:** Implementing integrated HIS presents an immediate information architectural challenges that has organizational implications. Adequate hardware, sophisticated information technology infrastructure. Three primary attributions of success were identified from the

descriptive statistics: willingness to change to new computer applications, effort, and persistence. In addition to the infrastructure, clearly, the software configuration has a critical influence on the implementation process and outcome [4].

Clearly, three out of four of these main categories fall under the umbrella of Business Process Management (BPM). If anything, this strongly re-iterates the fact that integrated HIS is not merely software implementation or an IT project. Thus, to ensure successful HIS implementation and running, health care sectors must pay sufficient attention to BPM.

### III. BUSINESS PROCESS MANAGEMENT (BPM)

A business process is set of interrelated activities which have definable inputs and, when executed, result in an output that adds value from a customer perspective. Business processes are quite simply the way work is done in any organization. They are cross-functional and go across the organizational functions, e.g. order fulfillment which spans all organizational functions from customer order to final delivery. BPM is a structured approach to understand, analyze, support, and continuously improve fundamental process such as manufacturing, marketing, communications and others major elements of a company's operations.

BPM is a wide and encompassing system that starts with top management understanding and involvement, focuses on process improvement across the supply chain, instills a structured approach to change management, and emphasizes people management and development.

### IV. BPM FOR SUCCESSFUL HIS IMPLEMENTATION

The importance and impact of BPM on integrated HIS success will be demonstrated in this section through assessing the experiences of six hospitals.

### V. CASE STUDY HOSPITALS

The case studies analyzed in this paper are shown in Table 1.

### VI. BPM ELEMENTS

As noted earlier, BPM has several main pillars. The following are highlights to demonstrate their importance in successful integrated HIS implementation.

### VII. EXECUTIVE LEADERSHIP

The experience of all six hospitals highlight the importance of having executive leadership directly involved in planning and implementing an HIS. KFSHRC's executive was instrumental in overseeing its integrated HIS project and the entire board reviewed and approved the plans. At KFMC and Dallah hospital, the decision to implement an integrated HIS was also made at the board level and the senior management team input was very important when selecting a suitable vendor.

Executive support and commitment does not end with initiation and facilitation, but must extend to the full implementation of an integrated HIS. KFSHRC, KFMC, SGHG, and Dallah hospital noted that HIS implementation is about people, not technology. The organization went through a major transformation, and the management of this change was carefully planned (from a strategic viewpoint) and meticulously implemented[10]. All the case studies analyzed have shown that the key to a smooth rollout is the effective change management from top. Intervention from management has been necessary to crucial for the adequate resourcing of the project, to taking fast and effective decisions, resolve conflicts and bring everybody to the same thinking, to promote company-wide acceptance of the project, and to build co-operation among the diverse groups in the organization, and in many times across national borders. Executive needs to constantly monitor the progress of the project and provide direction to the implementation teams.

Table.1

Hospital	Major integrated HIS Results
----------	------------------------------

King Faisal Specialist Hospital & Research Centre (KFSHRC)	<ul style="list-style-type: none"> <li>• Improving the quality of patient care.</li> <li>• Makes data retrieval faster</li> <li>• Makes management decision faster.</li> <li>• Provides better service to Patients.</li> <li>• More expansion and increase of activities in the same resource.</li> </ul>
King Fahad Medical City (KFMC)	<ul style="list-style-type: none"> <li>• Comprehensive Performance Reports.</li> <li>• Powerful Search Facility for patient records.</li> <li>• Use efforts and time more effectively and productively.</li> <li>• Lower inventory holding.</li> <li>• Better decision.</li> </ul>
Dallah Hospital	<ul style="list-style-type: none"> <li>• Reduce operation cost.</li> <li>• Access to timely and complete information</li> <li>• Cut the costs of operational systems, improved the reliability of customer service, and assured timely delivery and follow-up.</li> <li>• Data integration and standardization.</li> </ul>
Al-Noor Specialist Hospital	<ul style="list-style-type: none"> <li>• Makes data retrieval faster.</li> <li>• Provides better service to Patients.</li> <li>• Improved inventory record accuracy</li> <li>• Enhanced data visibility.</li> <li>• Reduction in operation costs.</li> </ul>
Dr. Abdul Rahman Al-Mishari Hospital	<ul style="list-style-type: none"> <li>• Comprehensive Performance Reports.</li> <li>• increased revenue and the decreased costs</li> <li>• Information can be accessed in real-time, meeting one of the prime objectives of the project.</li> </ul>
Saudi German Hospitals Group (SGHG)	<ul style="list-style-type: none"> <li>• Improving the quality of patient care.</li> <li>• Well controlled inventory system.</li> <li>• Improved financial control.</li> <li>• Reduce administrative costs.</li> </ul>

*Table 1. Case Studies of successful integrated HIS*

## VIII. PROCESS MANAGEMENT AND IMPROVEMENT

The two main areas in process management and improvement that directly affected integrated HIS success were business process change, performance measurement, and putting in place the appropriate process management structure.

**Business Process Change** – Proper business processes, re-engineering and accurate definition of workflows incorporating

global best practices will improve the effectiveness and efficiency of the hospital and in turn provide better patient care. The most common reason that hospitals walk away from integrated HIS projects is that they discover that the software does not support one of their important business processes. At that point there are two things they can do:

(a) They can change the business process to accommodate the HIS software, which will mean deep changes in long-established ways of doing business (that often provide better services to patients and staff) and shake up important peoples' roles and responsibilities. Or they can modify the HIS software to fit the process, which will slow down the project, introduce risky bugs into the system and make upgrading the software to the integrated HIS vendor's next release excruciatingly difficult, because the customizations will need to be torn apart and rewritten to fit with the new version. Without exception, all six hospitals agreed

that BPC is one of the main critical success factors for integrated HIS success. Rather than attempting to modify the software, KFSHRC, KFMC, Dr. Abdul Rahman Al-Mishari hospital, Al-Noor specialist hospital, Dallah hospital, and SGHG redesigned their business processes to be consistent with the software. This has proved to be critical to the project's success. The others undertook a mix of BPC and HIS software re-adjustment. Within this context, KFSHRC and KFMC have strongly emphasized on the criticality of structured project management approaches for integrated HIS success.

(b) **Performance Measurement** – It has been said that you can not manage what you do not measure, and this is especially true in the case of integrated HIS implementation. Health sectors must be able to establish a clear and well defined performance measurement system to allow them to assess the development, and/or problems, that are occurring. KFSHRC, KFMC, and Dallah hospital noted that having a well established measurement system was crucial in their HIS project management initiative to allow for measuring and publicizing success stories for motivation, assessing progress, assigning and redirecting resources, and instilling an overall system of continuous improvement for the integrated HIS life cycle.

(c) **Process Management Structure** - KFMC put someone "in charge" and centralized the management structure of the project in order to avoid duplication of effort. KFMC considered their project a success because of a centralized management structure. This has been implemented by KFSHRC, and Dallah hospital all saw this as an important

factor in managing the HIS implementation efficiently. However, even those with no 'HIS Process Leader' still maintained this focus by appointing a 'champion'. The project leader for the HIS project was clearly a "champion" for the project, and that role was critical to marketing the project throughout the organization.

## IX. CHANGE MANAGEMENT

The main hurdle faced by all the organizations was resistance to change. There will be resistance from users (for instance, from nurses, phlebotomists other paramedical staff, etc) who may feel that feeding information into the computerized system is additional work and not their primary responsibility or core competence. Indeed, staff were reluctant to learn new techniques or the IT department was reluctant to change due to attachment to its product; this was one of the main hurdles faced during the integrated HIS implementations [15, 16]. For users, the implementation of HIS means that their computer-related job tasks are completed in totally different computer environment. The complexity of these systems results in enormous learning curves and behavioral changes for user, implementers, and organizations. A variety of reactions by individuals, ranging from resisting to enthusiastically embracing HISs, are demonstrated, and unexpected difficulties often arise during all phases of implementation. Consequently, HIS users need to make sense of, and understand, their reactions to this technology, and their changing computer environment and computer-related job tasks. The attribution of HIS performance are important because they can either positively or negatively influence user's learning, confidence levels, effort, persistence, and use of these systems. Unfortunately, our understanding of individuals' reactions to HISs, and why they elect to use or avoid them, is limited [9].

Four elements which can help reduce the resistance are tremendous executive support; training and education, placement of best people on implementation; and heavy involvement of people from the field. The main approaches to achieve the sought-after people involvement and commitment is an open environment, characterized by open communication and trust.

Dr. Abdul Rahman Al-Mishari hospital, AL-Noor specialist hospital, KFSHRC, Dallah hospital, and KFMC agreed that effective communications should tell everyone in advance what is happening including the scope, objectives, and activities of the project, and admit that there will be change. Dallah hospital and KFMC saw an open and honest information policy helping the user to become acquainted with the new situation, to build up confidence in the project and its members, and finally to accept the project.

Open communication and ethical behavior generate trust. KFMC highlighted the relationships of trust among the project members as a main success factor for HIS package. KFSHRC noted that trust can be built up with intensive communication, coaching, delegation of responsibility, personal care and attention, among other things.

## X. PEOPLE MANAGE DEVELOPMENT

People management is clearly a subset of change management. However, some specific issues have been shown to directly affect the success of integrated HIS implementation, and were mainly in the area of people development. The implementation of integrated HIS package requires a whole new set of skills and expertise that organizations must pay extra attention to where these skills will come from. Two main streams have emerged and all six organizations have used a mix of both:

Training and re-skilling - Rigorous and continuous training and showing tangible benefits are the answers to overcome the initial resistance. Training is critical in an integrated HIS project. The most effective HIS possible will not improve health departments if their employees do not know how to use it. Installing an integrated HIS package without adequate staff preparation could yield drastic consequences. In this respect, KFSHRC and KFMC noted that the costs of training and support are often under-estimated, and these costs may be many times greater than originally anticipated. At Al-Noor specialist hospital, Dr. Abdul Rahman Al-Mishari hospital, Dallah hospital, and SGHG one of the critical workforce requirements for the project was the ability to obtain and train analysts with both "business" and technology knowledge. However, retaining these professionals was a significant problem because of their market value. SGHG, KFMC and KFSHRC invested heavily in training and re-skilling their developers in integrated HIS package software design and methodology. Dr. Abdul Rahman Al-Mishari hospital considered their project a success because of investments in training and support required to overcome technical and procedural challenges in design and implementation.

(b) Using external consultants - With new technology, it is often critical to acquire external expertise, including vendor support, to facilitate successful implementation. Hundreds of companies provide integrated information systems services. Those services may include all or some combination of these offerings:

- Road Map
- Change management
- HIS package selection
- Business process planning or changing
- HIS implementation
- Training
- HIS maintenance and support

Quite simply, when they didn't have needed expertise internally, KFMC brought in the consultants they needed. They stressed that good consultants improve throughput time and quality. The success of a project depends strongly on the capabilities of the consultants because the consultant is the only one with in-depth knowledge of the integrated software.

## XI. BEST PRACTICES FOR CAPITALIZING ON BPM FOR SUCCESSFUL HIS

This study believes that the best practices for capitalizing on business process management for successful HIS implementation, are the following:

The success of a major project like an integrated HIS implementation hinges on the sustained commitment from executive. An overall commitment that is visible, well defined and felt is a sure way to ensure a successful outcome.

1. Implementing an integrated HIS is not a matter of changing software systems; rather it is a matter of repositioning the health care sector and transforming the business practices.
2. Training - whole departments must be retrained, jobs redefined, and procedures discarded or rebuilt from scratch.
3. Performance Measurement - Because the successful implementation of an integrated HIS is contingent upon an accurate assessment of the associated organizational changes, there is a need to investigate the organizational consequences of HIS software.
4. Selecting the right employees to participate in the implementation process and motivating them is critical for the implementation's success.

## XII. CONCLUSION

Healthcare departments involve complex processes that span diverse groups and organizations. The implementation of Health Information System (HIS) to manage and automate the processes of has increasingly played an important role in improving the efficiency of healthcare enterprises. However, most of the Health Information System (HIS) implementations are big failures considering the time taken or the desired results achieved. However, the benefits of implementing a fully integrated Health Information System (HIS) – better patient care, increased efficiency, lower costs, etc. – can be enormous. But the price tag can also be large, and the time-to-payback long. Overall, it can be concluded that integrated HIS is far from being an IT project, and is more of an integrated clinical development approach that changes the way health departments do business, and the way work is done. Consequently, to implement HIS successfully, health departments must treat it like a change management project and focus on an integrated approach of Business Process Management. This paper has investigated the role and impact of business process management in successful integrated HIS implementation.

## REFERENCES

- [1] Anderson, J. "Increasing the Acceptance of Clinical Information Systems", MD Computing, Jan-Feb, 1999, pp. 62-65.
- [2] Beynon-Davies, P., Lloyd- Williams, M. "When health information systems fail", Topic in Health Information Management, Vol. 20, No 1, 1999, pp 66- 79.
- [3] Cain, M. and Mittman, R. "Diffusion of Innovation in Health Care", Oakland, CA: California Health Care Foundation, May 2002.
- [4] Holland, C. and Light, B. "A Critical Success Factors Model For ERP Implementation", IEEE Software, May- June, 1999.
- [5] Kelly, S.; Holland, C. and Light, B. "Enterprise Resource planning: A Business Approach To Systems Development", In: Proceedings of AMCIS, Milwaukee, WI, USA, 13-15 August 1999.

- [6] Rosemann, M. and Wises, J. "Measuring the performance of ERP software: a Balanced Scorecard approach", Wellington, New Zealand, 1-3 December 1999.
- [7] Sumner, M. "Critical Success Factors in Enterprise Wide Information Management Systems projects", In: Proceedings of AMCIS, Milwaukee, WI, USA, 13-15 August 1999.
- [8] Venrura, P. "Poor Project Planning Leads to ERP Failure", Arabian Computer News, Vol.18, July, 2003.
- [9] Wild, E., Hastings, T., Gubernick, R., Ross, D., Fehrenbach, S. "Key Elements for Successful Integrated Health Information Systems: Lessons From the States", Journal of Health Management Practice, November, 2004, pp. 36-47.
- [10] Brenda L. Killingsworth, Elaine Seeman. "An Integrative Health Information Systems, Approach for Facilitating Strategic Planning In Hospitals", in: Proceeding of the Southern Association of Information Systems Conference, 25-26 February 2005.
- [11] Kim, K.K. & Michelman, J.E. "An Examination of Factors for the Strategic Use of Information Systems in the Healthcare Industry", MIS Quarterly June, 1990.
- [12] Johnson K.F., "Integrated Systems Brings Hospital Data Together", Health Progress, October, 1987.
- [13] Hejna, W. J., and Hosking, J.E., "Five Critical Strategies for Achieving Operational Efficiency". Journal of Healthcare Management, September 2004.
- [14] K. Dhinesh Kumar, H. Roth, L. Karunamoorthy, "Critical Success Factor for the Implementation of Integrated Automation Solutions with PC Based Control, in: Proceeding of the 10th Mediterranean Conference on Control and Automation MED 2002, Lisbon, Portugal, July 9-12, 2002.
- [15] Uttam Kumar Tripathi, Knut Hinkelmann and Daneila Feldkamp, "Life Cycle for Change Management in Business Process using Semantic Technologies", Journal of Computers, Vol. 3, No. 1, January, 2008.
- [16] Hartini Ahmad, Arthur Francis and Mahamed Zairi, "Business Process Re-engineering: Critical Success Factors in Higher Education", Business Process Management Journal Vol. 13, No. 3, 2007.
- [17] Cecilia Kennedy, "Critical Success Factors for Implementing a Clinical Information System", Health Care Industry, September, 2000.
- [18] Public Health Informatics Institute "Evaluation Toolkit for Integrated Health Information Systems", February, 2007.