

Pre-implementation Framework for Electronic Medical Record Project

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Abstract. Even though the Electronic Medical Record (EMR) projects have been going on for many years, with many groups of stakeholders involved, it was found that there was no clear guidelines in terms of the stakeholders' role in the EMR projects. This paper attempts to fill in the gap in the existing implementation plan by introducing the pre-implementation framework for the EMR projects. This framework focuses on the role and responsibilities of all the stakeholders that have been identified from the literature. Six stakeholders are involved in the EMR projects:- 1) the Government, 2) the healthcare organization, 3) the IT personnel, 4) the end-users, 5) the healthcare application developer, and 6) the suppliers. The pre-implementation framework for the EMR project was constructed by using the Activity Diagram with the Unified Modeling Language (UML) notation to show the clear roles of all stakeholders. This paper also describes four elements involved in the pre-implementation framework:- 1) Preparation of the Stakeholder, 2) Hardware Preparation, 3) Preparation of the Developer, and 4) Software Preparation. It is hoped that the pre-implementation framework proposed in this paper could be used as a guideline to implement the EMR system.

Keywords: *Malaysia, Pre-Implementation, Project Management Framework, and Electronic Medical Record.*

1 Introduction

Electronic Medical Record System (EMR) is one of the important components in Hospital Information System (HIS) (Mohd & Syed Mohamad, 2005a). EMR provide patient medical history to other HIS application such as pharmacy, billing, administration, and it can also be used by healthcare professionals for research purposes. Manaf (1996) stated that the used of information technology (IT) in health sector is needed to allow patient access for healthcare in various point of care and doctors can easily refer to the same patient medical record. EMR has been introduced to eliminate the weaknesses of paper-based medical record such as lost of patient medical record, misplaced, scatted patient medical record in various healthcare points and illegible writing in medical record (Berwick et. al. 2000, Sanchez et. al, 2005).

In the year 1999, a fully integrated HIS was pioneered at Selayang Hospital followed by Putrajaya Hospital in the year 2000 (Hashim & Hadis, 2004). In the year 2004, HIS projects were extended to two other hospitals: Pandan Hospital and Serdang Hospital. Another three hospitals in East Malaysia, that are Pitas, Kuala Penyu and Kunak Hospitals are still in the planning stage (Hassan, 2004). Each of these projects has its Core Team that is headed by the hospital's director.

The team members are nurses from various departments. Core Team's roles are to provide requirements to HIS development team.

Even though EMR projects have been going on for many years, with many groups of stakeholder involvement, we found out that there is no clear guideline in terms of stakeholders' role in the project management. We believe that, clear role of each stakeholder is important in determining the success of EMR projects.

This paper attempts to fill in the gap of existing implementation plan by introducing the pre-implementation plan framework for EMR projects. This framework focuses on the role and responsibilities of all the stakeholders that we have identified from literatures.

2. Literature Review

The implementation plan for the Hospital Information System (HIS) has been endorsed by many countries such as Malaysia (Hashim & Hadis, 2004; Hassan 2004), Indonesia (Lestari, 2004), Singapore (Yap, 2004) and United States (Chin, 2004) with various strategic plans at the levels of the health ministry and ground implementation. Hashim & Hadis (2004) stated that the implementation stages need the involvement of many players in order to be competitive and innovative. Hence, the Ministry of Health (MOH), Malaysia has established a core team unit headed by the director of the hospital and represented by various levels of healthcare services, the IT department and end-users. They are responsible for constructing the Business Process Re-Engineering (BPR), functional requirements, the walkthrough, the gap analysis and the data collection. They are also involved directly in software development and customization (Hassan, 2004, Lestari, 2004). Hassan (2004) also mentioned that product champions were formed to drive the change of management process. However, one of the challenges was the unclear organization of the project management because there were too many stakeholders. Hassan and Yap (2004) stated that the IT infrastructure such as the network, the help desk, and on-site support should be set-up by the suppliers in the early implementation stages. Lestari (2004) stated that the implementation of the EMR system needed a suitable hardware that can support the huge volume of data and complex business processes. She further stated that the user interface of the EMR system has to be redesigned according to the users' need. Chin (2004) listed lessons learned from the Kaiser Permanente Northwest (KPNW) in the early development of the EMR system :

- 1) Identify bridges that able to bridge the gap between the end user and the organization. They are able to identify the easy-to-implement functionality and avoid the functionality that hard to implement and have unclear long-term benefits,
- 2) Listen and evaluate the criticisms of the end-users about the system as it may lead to the enhancement of the system.
- 3) Provide on-going training and continue evaluation on users to optimize clinicians efficiency and effectiveness.
- 4) End-users become beta-tester to identify the weaknesses of the system.
- 5) The project team should react to the user problems immediately.
- 6) Set priority to the clinician efficiency,
- 7) End-users determine the success or failure of the content because it directly affects the end-users.

The strategic plans discussed in the literatures indicated that the stakeholder involvements are very crucial. Therefore, proper planning of the implementation of EMR system in healthcare organization especially detail specification on the role of stakeholders is necessary to increase the user acceptance of EMR system. The implementation stages of EMR system should be divided into three major stages: 1) pre-implementation plan, 2) intermediate implementation plan, and 3) post implementation plan (Mohd, Syed Mohamad, 2005a). Kirk (2003) has stressed the need to construct and debate the legal and social framework for acceptance of EMR system. User

acceptance of the system could be achieved if all the stakeholders seriously involved started from pre-implementation stage up to the post implementation phase. (Gefen, 2003, Zdon, 1998, Anderson, 1997, Moore, 1996, Baroudi 1986).

Anderson (1997) stressed that the physician involvement is not only in the transition process but also along the way of development phases of the system. When the system is ready to be implemented at health care provider site, a proper planning of the transition process must be addressed clearly. There are a few phases in transition process:

- (1) to educate staffs with computer literate and the new workflow scenario of using EMR system (Lestari, 2004, Erstad, 2003, Andrews, 2003, and Kirk 1999);
- (2) the commitment from doctor in the transition process (Carr, 1999, Zdon, 1998, Chin, 2004);
- (3) proper planning of system installation;
- (4) ongoing training plan (Carr, 1999);
- (5) commitment from vendors (Carr, 1999, Andrew 2003); and
- (6) Researchers contribution (Andrews, 2003).

Andrews (2003) stated that during the implementation phase, the vendor's representative should be readily available in the organization in order to provide training and technical support. Andrews (2003) and Carr (1999) listed the activities that have to be set up at the initial stage of implementing the EMR project:-

- (1) Create physical infrastructure that involve identifying, designing and renovating space, designing and building a training center and relocating the team (Yap, 2004);
- (2) Create data communication infrastructure that involves designing and building a local as well as a wide area network, and planning on installing the hardware (Hassan, 2004, Yap, 2004);
- (3) Analyze the clinical workflow which includes the process redesign of the workflow based on electronic procedures (Lestari, 2004);
- (4) Provide software customization service organized by the vendor at the health care provider site;
- (5) Establish team training to be in charge of training activities;
- (6) Organize ongoing training for the EMR users;
- (7) Complete system documentation such as user manuals and technical documentation that should be provided by the vendor;
- (8) Proper planning for the transition and implementation of the EMR system;
- (9) Provide software and implementation support unit that is in charge of various technical aspects that are related to the system.

Even though most of the literature emphasized the continuous involvement of all stakeholders, we the researchers could not find an overall implementation framework that could be referred by the EMR project management team. This situation warrants the researchers to construct the EMR project pre-implementation framework as discussed in the next section.

3. Discussion

Based on the literature review, it can be concluded that there are six groups of stakeholders in EMR projects. Figures 1a and Figure 1b show the activity plan according to the roles of the stakeholders: 1) the Government, 2) the healthcare organization, 3) the end-users: doctors, nurses,

and administrators 4) the IT personnel, 5) the healthcare application developer, and 6) the healthcare suppliers.

Researchers have found four elements that are involved in the pre-implementation stage : 1) Preparation by the stakeholder, 2) Hardware Preparation, 3) Preparation of the Developer, and 4) Software Preparation.

3.1 Preparation by the Stakeholder

Preparation by the Stakeholder includes the following: 1) support from the Government and top level management in the healthcare organization in terms of providing the IT budget for maintenance and training. The Government and the healthcare organization should play a role in preparing the policy for the EMR project, its standards, the implementation plan, establishing the healthcare committee, and allocating the IT plan budget for healthcare; 2) the commitment and self-preparation from end users such as the doctors, nurses, and the healthcare administrators in terms of attending training sessions and the willingness to adapt with the transition from paper-based medical record to electronic medical record; 3) the commitment and the availability of the developer's team and hardware suppliers on the healthcare organization site to provide support in the event there are any problems with the maintenance of the hardware or software as well as to conduct training sessions and to man the help desk; 4) the Information Technology personnel together with the hardware and software vendors should be readily available to provide support for the hardware and/or software support, when necessary. They must also be well-trained in order to manage any hardware and/or software problems. More importantly, the IT personnel and the developer must be directly involved in the EMR system development stages so they can provide efficient service to the end users.

3.2 Hardware preparation

Hardware preparation is related to the establishment of an efficient network backbone; a high capacity server that can support a large volume of images and x-ray diagrams, and a high-capacity computer device are needed in order to gain quick access to the information in the EMR system. The most important factor is a high-speed processor in the computer system. Proper hardware preparation is needed because the server will keep patients medical records for a long time and they will grow bigger over time and this may affect the performance of the hardware. Another important factor is to get established hardware suppliers that can provide quick service maintenance as required.

3.3 Preparation by the Developer

Developers should play a role in understanding the workflows of the end users by analyzing the tasks performed as well as the ethnographic characteristics of them. They must also have good communication skills in their interactions with the users. Developers should also provide user manuals and continuous training sessions plan to users. The training activities should be properly planned in order to provide stimulating activities from novice to expert users.

3.4 Software preparation

The transition process from manual to electronic should be implemented in phases; first, select the appropriate module from the system and deactivate the rest of the modules; then, start the training activities on how to operate the module. Once the staff has mastered operating one module and it has become a routine, the next module can be activated. The training process is

continued right up the time line that has been set up earlier. Developers must also provide user manuals and these handbooks should be made available in every point of the workstation. As proposed by Mohd and Syed Mohamad (2005a), instead of the pre-implementation framework, two other implementation stages, the intermediate and the post-implementation, should be constructed in order to obtain the complete framework for the EMR system.

3.5 Important factors for the success of the EMR project

The factors for the successful implementation of the EMR project can be concluded as follows:-

- 1) User involvement in the design process.
- 2) Set-up proper infrastructure for implementing the IT application.
- 3) Support from top-level management in the change management process, funding and all activities related to the IT implementation.
- 4) Continuous support from the developer in terms of providing periodic training to users, system maintenance, updating the system when necessary and responding to the users' problem immediately.
- 5) Provide support to any research development related to the pre-, intermediate, and post-implementation stages of the EMR project and other research related to IT application in the health care organization. The feedback of the research can be used to enhance the IT application in the organization.
- 6) Establish a clear policy of the implementation of the EMR project as well as various standards related to the system such as a clear definition of EMR, the terminology, the processes, and the workflow.
- 7) Provide clear documentation as terms of reference and guidelines to all stakeholders.

4. Conclusion

The implementation of the EMR system is complex and involves multidisciplinary effort. It is hoped that the pre-implementation framework proposed in this paper could be used as a guideline for implementing the EMR system. It also provides a guideline for Health Information researchers to enhance the existing implementation of the EMR model that specifically focuses on to the role of the stakeholders in the implementation stages.

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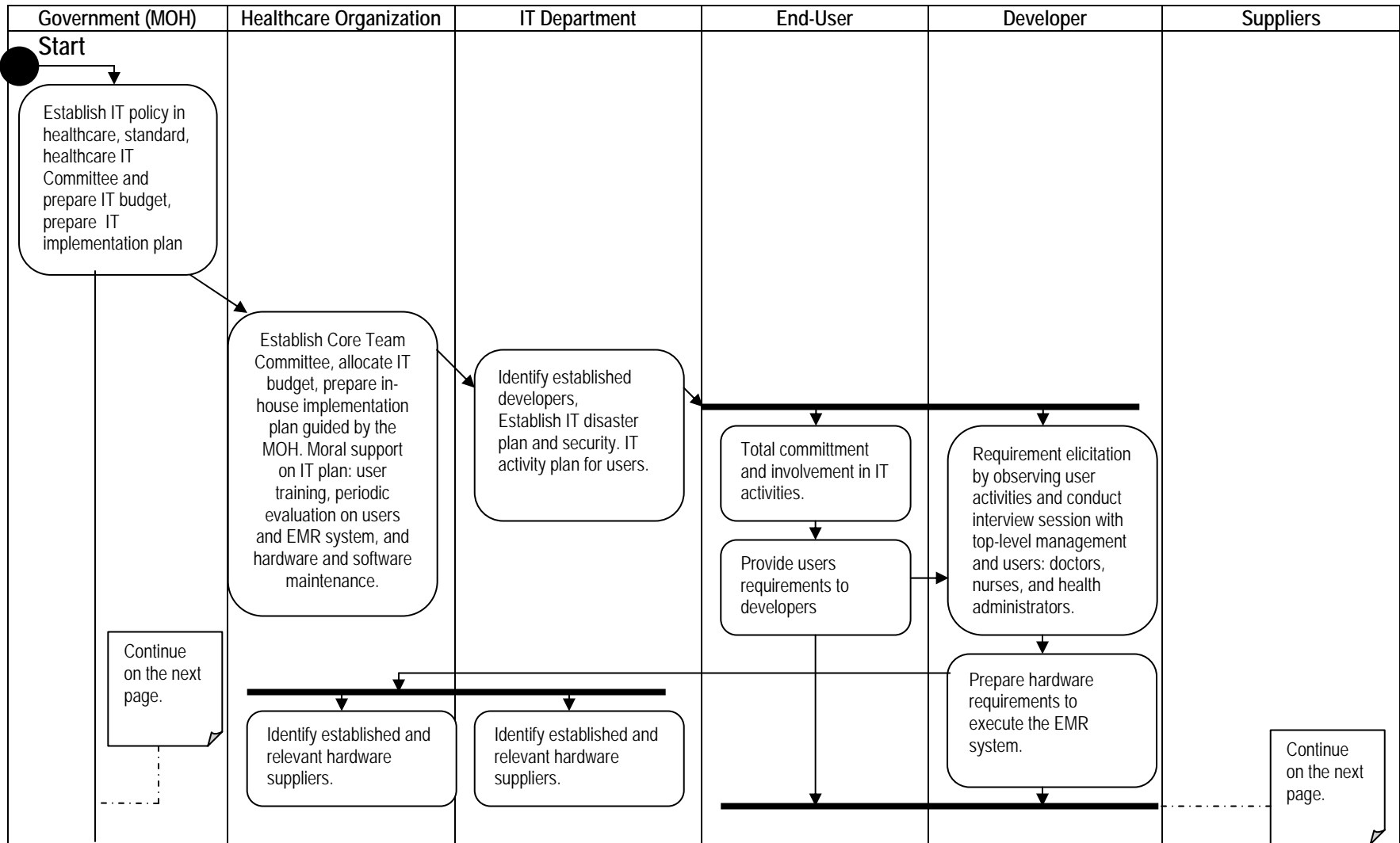


Figure 1a Activity Diagram: Pre Implementation of EMR system

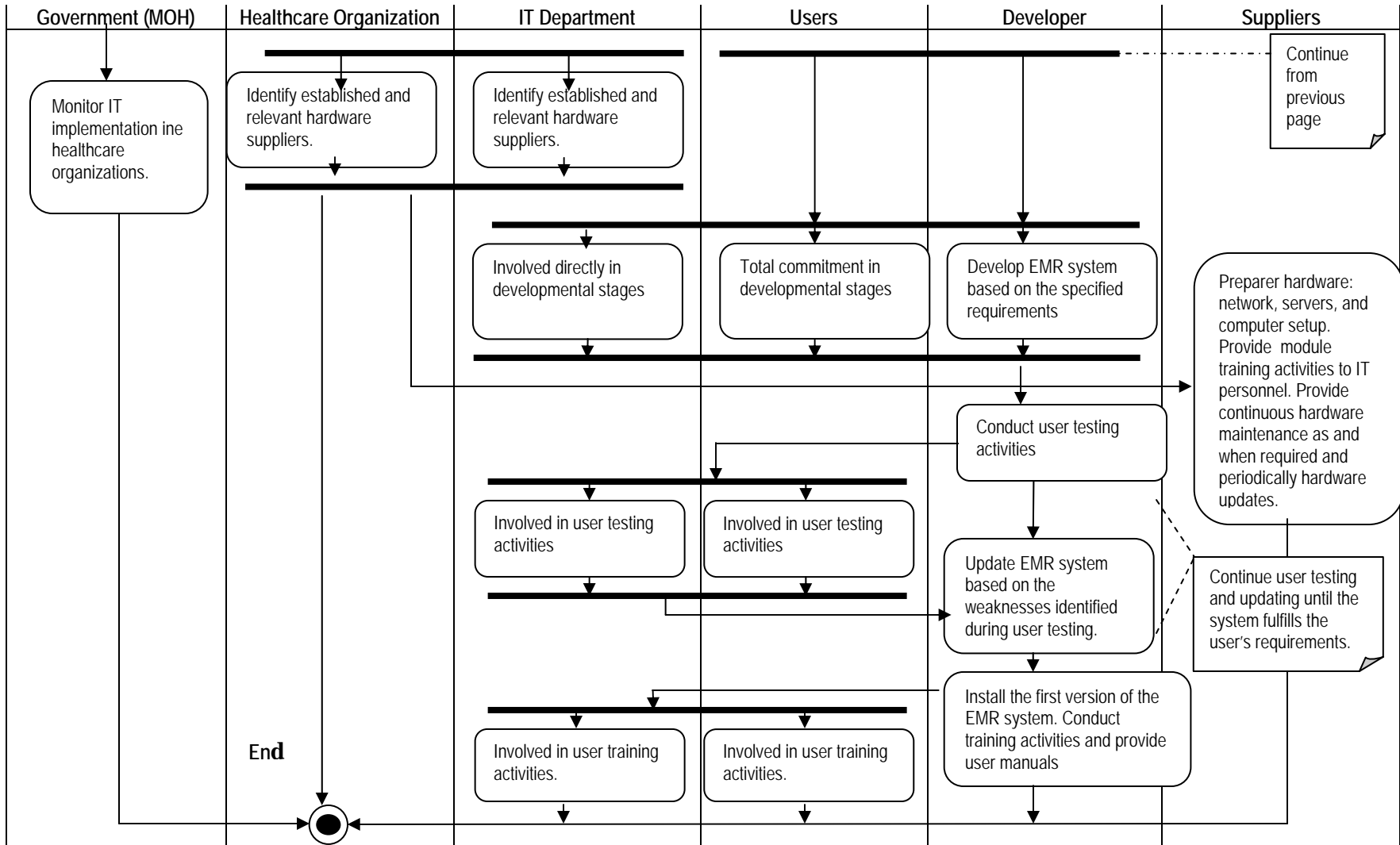


Figure 1b Activity Diagram: Pre-Implementation of the EMR System (continued)

