CRITICAL SUCCESS FACTORS FOR THE INTRODUCTION OF A CLINICAL INFORMATION SYSTEM

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Abstract: There exist some certain factors considered as critical that determines the success, failure or delay of the completion of IT projects. This paper discusses some of the critical success factors that we re identified during the Introduction of a Clinical Information System to a Greek Hospital. More specifically, it discusses the importance of choosing the most appropriate clinics to start the project, the need for outsourcing certain services, the need for a Laboratory Information System, some training issues, the system's acceptance by the users, the promotion of the project within the Hospital, the system's evaluation, the need to include resources in the annual budget for IT and finally, some s/w and h/w matters. Lastly, it is verified that critical issues in the implementation of Information Systems are social and organizational and not solely technical.

Introduction

"G. Gennimatas" hospital is an 800 bed general hospital spread in an area of 64.000 square meters at Athens, Greece. It serves a population of over one million people. It has over 800 physicians and an annual budget of almost 35 billion drachmas (~100 million Euro).

It installed its first IT module in 1993 and ever since it is consider the pilot hospital regarding the introduction of IT in the public health sector of Greece.

Two years ago a project concerning the introduction of a Clinical Information system started in "G. Gennimatas" hospital [9]. For that reason a schedule was carefully designed in order to anticipate all the possible situations. Nevertheless, and as is the rule for all IT project, once again the project seems to gone out of schedule and many factors had to be reconsider.

The scheduling of the project resulted from the co-operation of the following parties: the hospital's MIS Department, CTI[1] as the technical consultant of Greek Ministry of Health and Welfare (GMHW) and the vendor responsible for the implementation of the Clinical Information System.

In this paper we outline and discuss the real world issues impacting the introduction the CIS in a general hospital of that size.

Implementation of a Clinical IS in a regional state hospital

Information Technology applications were introduced at the "G. Gennimatas" hospital in the early 90s. The Ministry of Health and Welfare invested in the development of an *Integrated Information System for Administration* of a Hospital, known as IIASH, and assigned this project to KHYKY one of the state's computer serving organisations.

The first applications started to launch in 1993. The administration of the hospital's Pharmacy Department was the first installed application. A year later, the Patient's Admissions Office and the External Patients' Appointment Office were installed. Then, the Billing Department's application was installed. In 1996 the software applications for the Warehouse and Supply Departments were used productively. A year later, the software application for the Dietary Department was installed. In 1998, the last software application was installed concerning the Accounting Department that is interconnected with all applications.

The IIASH system was developed under the close supervision of the users of the system. Hence, this Information System is widely accepted by the users and in the short period of time of few weeks each application was productive to the benefit of the patients and the Hospital.

In the fall of 1998 a Clinical Information System was introduced in the hospital [8]. This system is in its roll out phase now having introduced in almost half of the clinical departments. So far, there have been activated specific and discrete functions of the Clinical

[1] Computer Technology Institute (CTI) is the technical consultant of the Greek Ministry of Health and Welfare regarding IT programs within Community Support Framework 1994-2000 (jointly funded by EU and Greece).

Information System, sending drug orders to Pharmacy, keeping records on patients' follow up, issuing discharge documents, etc. The need and the related service to book patients' laboratory examinations (clinical orders) and receiving the results electronically became apparent during the first few weeks of operation. The nurses, first, trained in the use of the system and two pilot clinics operated the system successfully. Due to the lack of nursing personnel, the hospital asked and received outsourcing services from the vendor of the system who provided eight (8) well trained data-entry operators, a supervisor for them and a systems' engineer.

Critical Success Factors

There is a substantial literature on success as well as failure stories regarding the introduction of HIS (and more generally of IT systems). In the followings, factors that played a major role during the deployment of the project are discussed.

Start from the right places

Choosing the right clinics to participate in the first steps of the system is essential. Directors of these clinics need to have sufficient determination and the courage to maintain a commitment to the original decision. The must have recognised that this project was going to disrupt their clinics and that getting people to change their habits would not always be easy.

Thus firstly involving the clinics with the above characteristics and assuring them that they would have the flexibility to "customise" the system the way they wanted, the first and perhaps the most important step was a reality.

Outsourcing

In order to satisfy the need of covering the secretarial work of the clinics (data entry), additional personnel must be hired. The hired personnel must be adequately trained to develop the necessary consciousness to handle sensitive medical data. The skilful use of the Clinical Information System and the knowledge of all procedures carried out in the clinic are required. The training of those personnel must be overviewed by both the clinic's director and the manufacturer of the Clinical Information System. The training must ensure that the employs know all about the operational functions, the habits and the peculiarities of the procedures in each clinic and at the same time they are available to use the Clinical Information System to document the carried out medical procedures.

It is expected that in the near by future, the medical doctors and the nursing personnel will start to use Clinical Information Systems when they will have adequate computer training in their basic academic education. Meanwhile, another clinical staff category will be created to fill up the demand. Currently, well-trained personnel will be employed to work along with the nurses and the medical doctors. Medical data will be given by the nurses and the medical doctors to the data entry operators to enter the data into the Clinical Information System. It is a matter of time for the medical personnel of all levels to realise that time is wasted and another source of errors is involved in the documentation of medical services for which they are responsible, not the data entry operators.

On the other hand and since a new Information System is introduced in the hospital, new technical stuff must be hired to support the MIS department. A new Information System in other words mean a new computer server, possibly a new operating system and a database, tens of personal computers as well as various peripherals. All this equipment must somehow be maintained especially after the completion of the project, when the vendor's people are leaving the place. Since, as it applies to most of the cases, the MIS Department staff is already overloaded, the only effective solution is to hire additional informatics people or to outsource the management of the system.

Laboratory Information System

An ordinary medical doctor depends the diagnostic and the therapeutic procedures on the results arriving from the analytical medical laboratories. The results receiving process may be characterised as an important factor in the medical decisions of a doctor excluding any doubts caused by sloppy written results or even systematic errors of any source. Also, the clinic's staff does not have to be concerned with the transfer of paper documents since the orders for examinations and the corresponding results travel on the installed computer network.

The interconnection of a Clinical Information System and that of a Laboratory Information System provides the ability to the clinical staff to send the data of inquires for medical examinations to laboratories any time of the day. Similarly, the results are received by the clinicians when they are available at the laboratories and they may be entered directly and without any effort into the patient's medical record. Virtually, all laboratories are sensed as being next to the clinic receiving and sending back data about medical examinations that are stored directly into the patients' medical record.

The data interchange among any of the clinics and the laboratories assists the medical doctors to diagnose and order the patients cure based on evident data. In addition, the medical doctors have the availability to compare a patient's results arriving from the laboratories or to investigate the reliability of the received results on a set of patients' data.

Training Issues

It is rather impossible to stop the operation of any

clinic and let the personnel to participate in formal training procedures. Instead, the only available training schema is limited to train selectively the staff while it is performing its regular duties. Such a training approach demands to break down the software's functions into discrete operations and introduce them when the medical stuff is carrying out its every day practice. The impact is focused on the facts that the personnel realises better the software's operability and the training period is the shortest possible since the trainees are employing the system's functions while they are supervised by their instructors.

There are certain reasons in order to provide continuously periodical training. First, the users have very limited time to consult the documentation that escorts the installed software. Next, there may be newly hired personnel. Lastly, some procedures may not appear to be so efficient as they planned to be. Therefore, the personnel must be trained in certain periods of time in order to ensure that their weaknesses will be improved and at the same time, to offer the necessary ethical security that naï ve users need in order to be encouraged to use the system.

User's Acceptance

Installing a computer system in a medical environment, eventually, it will cause certain changes in practice that tend to become traditional for the employee's working life. The medical staff appreciates and feels more comfortably with the use of the developed terminology and the implementation of the procedures deployed before the system's use.

There exist available several options to evaluate the users' skilfulness and acceptance towards the installed system. First, a quantitative and then a qualitative, examination of the stored data always reveals the users' moods about the system and its usage. Next, a careful and a well-organised observation of the working environment indicate the negatively affecting the performance factors. Lastly, gathering and then evaluating the users' opinions and suggestions in order to come to fruitful conclusions and required corrective actions. After all, the users have the expectation to enjoy effective and immediate system's support. Adequate users' support is a necessity and assists the user's confidence since all patients are treated through the installed computer system.

Promotion of the work

A clinical computer system is part of the Hospital's system. The employees have to know about the existence and the impact of the use of the system at the rest of the Hospital's posts in order to assist, if it is required, and to feel to be part of the same team. The work and the obtained goals have to be announced and be known to all Hospital's personnel. The Hospital's management ought to promote the successful efforts circulating the corresponding announcements in the form of a news-letter informing about the common problems and the common achievements too making everyone participant in the effort to productively use an integrated computer system in the Hospital.

Annual Budget for IT

The Hospital's computer system is evolving along with the current needs and new challenges in the medical field. Also, the scientific research and technology place the Hospital on the direction of predetermined tracks that it has to follow without objections. The Hospital's management must be prepared to follow the rapidly changing trends in the area of computers. The management must have available all the necessary funds to covers the associated cost for upgrades and the corresponding training.

System's Evaluation

The performance of the computer system must be regularly examined and evaluated in order to ensure that the predefined goals are constantly obtained. For each of the system's parts, there must be a set of procedures and checking points that objectively provide the quantitative evidences that imply the corresponding qualitative objective evidences. The management of the Hospital must keep the most recent and clear picture of the operational system's conditions in order to intervene rectifying the problems. The auditing of the system's performance must be performed by both internal and external auditors that provide to the Hospital's management evidently documented data.

Software and Hardware matters

The performance of the installed software must be frequently examined in order to prove its efficiency in the expected way. The installed hardware must be regularly examined and tested in order to record its performance and it must be evaluated against its maintenance needs and cost, its response time with or without load, and its uniform compatibility.

Conclusions

The introduction of an Integrated Hospital Information System involves difficult and time-consuming tasks and its course of success depends on factors that are directly proportional to the holding situation in each hospital. Therefore, certain IT solutions are impossible to be applied to different hospitals without modifications to include local peculiarities, both organisationally and culturally.

The major limiting factor [1] to the successful implementation of such systems is the lack of data-entry and system use by physicians at the point of care. Even though this is an undoubted fact, certain measures can

be applied in order to overcome this barrier: outsourcing data-entry services (as well as IT services) will definitely increase the acceptance of the system among the users. In parallel, a well-organised training program for the users will assist them to overcome the obstacles during the first period of the productive use of the system.

On the other hand, it is essential to install and start the productive use of the system from those clinics within the hospital that the personnel seems to be more determined than others in order to minimise the possibilities of failure. The physicians of those clinics are in position to appreciate thoroughly the benefits from the system's use if there exist an interconnection to the Laboratory Information System.

The actual participation of all hospital's personnel is required for the success of the project since they are all working as a team to promote the public health. The circulation of a newsletter will inform and motivate all employees, each from its own post, towards the successful application of the system.

The IT system must evolve according to the hospital's changing needs and there must exist some mechanism providing the necessary feedback for the corresponding modifications to meet the requirements. The mechanism that provides such valuable feedback information is obtained through a continuous evaluation of the system with well-defined procedures and work instructions.

The hospital's IT infrastructure must be coupled and in compliance with the technological development of both the biomedical and informatics sectors. Therefore, the IT system must be supported by the necessary funds on a yearly basis in order to be maintained at the current state of the technology.

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