A Plan for Implementation of Hospital Information System in Developing Country: Recommendation from socio-technical perspective.
Abstract

Hospital Information System (HIS) is considered as an important factor in health care sector for managing the administrative, financial and clinical aspects of a hospital. A large number of hospitals from both developing and developed countries are adopting hospital information system to bring efficiency in their current system. Current study is conducted to contribute to the literature regarding HIS implementation in developing country settings as there is scarce literature. This study attempts to improve the understanding of HIS implementation in developing countries.

In this study, socio technical model is used to understand the current working system of cardiology department of Combined Military Hospital (CMH). Qualitative case study is conducted for this research. Data is collected with the help of interviews done online via Skype and some secondary data resources to highlight the problems and solutions before HIS implementation. The data collection, generation of results and analysis is done on the basis of structure, people, technology, and process perspective originating from the socio-technical model. Findings of this study are presented in the form of recommendations which need to be considered for making a HIS implementation plan.

Key Words: Hospital Information System (HIS), Combined Military Hospital (CMH), Socio-Technical Model.
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## Abbreviations

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>CMH</td>
<td>Combined Military Hospital</td>
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<tr>
<td>DBMS</td>
<td>Data Base Management System</td>
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<td>GDMOs</td>
<td>General Duty Medical Officers</td>
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<td>HIS</td>
<td>Hospital Information System</td>
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<td>HOD</td>
<td>Head of Department</td>
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<td>ICT</td>
<td>Information Communication Technology</td>
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<td>IS</td>
<td>Information System</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>LAN</td>
<td>Local Area Network</td>
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<td>PIMS</td>
<td>Pakistan Institute of Medical Sciences</td>
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1. Introduction

Objective of this chapter is to explain the context of the thesis topic and addressed the stated problem. This chapter includes the explanation of the research question, aims and objectives, justification, scope and limitations.

1.1 Background to Study

In the late 1970s and early 1980s the computer use began to become increasingly common in healthcare environments. The use of computers has radically changed the science and practice of health or medical informatics (Shortliffe & Blois 2006). Since then, improvements in the efficiency of computers, computer networks, and the internet have helped the healthcare professionals to support their decision-making processes by increasing the accessibility and availability of information (Winkelman & Leonard 2004). Throughout the world, various organizations are implementing Information Systems (IS) to enhance the business processes and to have efficient information flow for their day to day business activities. Similarly the hospitals are also implementing IS for increasing the accessibility and availability of information to improve the patient care and decision making processes.

General importance of IS in the health care sector is that commonly no health facilities can be managed efficiently without IS. As Cibulskis and Hiawalyer (2002, p. 752) has stated that, “Information on health needs, the delivery of services, and the availability and use of resources is important to all health service organizations”. These both can be provided if information in health care sector can be managed properly. Cibulskis and Hiawalyer (2002) proposed that organized information helps any organization to boost up its efficiency, effectiveness and responsiveness in many ways. These ways include; it helps managers for planning the alignment of health system resources with clients needs, it can help in increasing accountability within an organization, it can help in marketing the health agendas and employ social support, and it can also help in providing valuable know-how with in the organization which can lead to greater efficiency in the various process. It has been found in previous studies that health organizations had faced problems in acquiring information for using it to get the discussed benefits.

Information could be managed and organized within any organization by implementing proper IS. IS is generally referred to as computer system that helps in collection, storage, processing, retrieval, displaying and communicating the appropriate information needed during any task to perform it efficiently. In health care sector IS helps in reducing inaccuracy and increase efficiency of healthcare organization for providing good health
care. IS also helps in reduction of health care costs by managing services and improving quality of care (Malliarou & Zyga, 2009).

The IS for hospitals is generally termed as Hospital Information System (HIS). HIS is considered prerequisite for the efficient delivery of high quality health care in hospitals. Hospitals around the world are adopting HIS for enhancing their efficiency for providing improved healthcare. Previous studies have shown that health care sector is facing many problems in adoption of IS. According to Sagiroglu and Ozturan (2006), adoption of HIS in hospitals is a complex task compared to other IS in different fields.

Current study focuses on the potential problems solving before HIS implementation for Combined Military Hospital (CMH), Muzaffarabad, Pakistan. CMH is situated in developing country settings and in developing countries hospitals are the main healthcare providers (Clifford et al. 2008). In developing countries the IS in hospitals are rare to nonexistent (Rotich et al. 2003). The countries, where there is lack of awareness and appreciation of electronic HIS, implementing HIS would be a hard job to do. If a hospital in a developing country decides to change its manual IS to an HIS, there would be rare but useful experience to guide that hospital through the whole implementation process (Ovretveit et al. 2007). The cases from the developed countries cannot be utilized by the hospitals of developing countries because of the difference in circumstances, systems, processes, and cultures (Rotich et al. 2003).

HIS helps in management of administrative, financial and clinical feature of a hospital in an efficient way. The main goal of HIS is to achieve the conceivable care of patient and facilitate administration in various tasks by providing electronic data processing. HIS enables the management to access the information at right time for efficient decision making (Berg, 2001). Though HIS can provide various advantages to a hospital but still failure are however more commonly seen in the domain of health informatics (Berg et. al., 2003). HIS implementation requires proper planning and considerable investment in funding, effort and time for implementation. Something must be done to minimize the potential of failure for any HIS implementation but more so in developing countries where funding is difficult to get and often limited, success must be assured to the best of foreseeable instances (Heeks, 1999).

1.2 Problem Statement

Exploration of problems and troubleshooting before the implementation of HIS in CMH is the main aim of this study. We are going to introduce CMH briefly before explaining the main problem.

There is a chain of CMHs in Pakistan which are base hospitals of Pakistan Armed Forces to provide services for both army personnel and civilians. The doctors of Pakistan's Army Medical Corps run these hospitals. General Duty
Medical Officers (GDMOs) are responsible for carrying out the administration. The patient’s management and care is mainly the duty of the doctors of specialist care. On the basis of capabilities and tertiary care, secondary care and primary level care, CMHs are categorized into A, B and C classes. CMHs are located in various cities of Pakistan. We have selected one of this chain of CMHs for this study. The selected CMH is situated in Muzaffarabad. It is rated class A and it is administrated by Brigadier Doctor as a GDMO.

In CMH the current working environment is manual IS. They are using paper based file system for keeping the record of patients. Most of staff of CMH is well aware of using the computers. Available computers are used only for routine tasks like using internet for getting help in different scenarios, preparing hospital documents and sometimes for keeping record of staff. As it is discussed above that IS has radically changed the healthcare sector so CMH management has also decided to introduce the IS in their working environment so they can enhance their performance and provide better healthcare. CMH is planning to implement HIS because the management thinks that a successful HIS must enhance the quality of work within the clinical settings and promote improved patient care. The implementation of HIS is a challenge for the management of CMH as they are stuck with the questions like how to start and from where to start the implementation process. According to Ovretveit et al. (2007), this happens just because of scarce cases for developing countries about the implementation of HIS. The available cases are not sufficient to guide CMH to make an appropriate plan so that they can start implementation process. Due to this CMH is facing the problems to get some guidelines for implementing HIS. The literature from developed countries cannot be utilized by the hospitals of developing countries because of the difference in circumstances, systems, processes, and cultures (Rotich et al. 2003). HIS is successfully implemented in Pakistan Institute of Medical Sciences (PIMS), Islamabad. Malik and Khan (2009) studied to explore the success factors of HIS implementation in PIMS. Their study shows the general steps for successfully implementing HIS in PIMS that cannot be utilized by CMH because of different organizational culture. PIMS is public hospital and CMH is military hospital. Both hospitals have different working environment, processes and functions.

The main problem, which CMH is facing, is less understanding of HIS implementation due to lack of practical examples to look at. They do not have any idea of the problems that might occur before implementation of HIS so that they can start the project. It means that due to fewer examples, people of this sector are afraid of implementing HIS, because it requires huge amount of funding and initiate a change process. According to Kotter (1996), for a change process, there is no surety of its success. Management of CMH is in dilemma that what will happen if this implementation fails? And answer to their question is loss of money, time and their previous
working culture. Now to properly handle this situation or failure factor, there
must be some knowledge, cases to learn from and guidelines to follow to
make a proper plan for starting HIS implementation process. This study is
carried out to provide the required literature to CMH which they can use as
guideline for making plan for the implementation of HIS. It will also
contribute to the literature regarding implementation of HIS in developing
country settings.

1.3 Research Question

On the basis of the above discussion, we are interested to study problems
and troubleshoot these problems before the implementations of HIS in
CMH, in terms of structure, people, technology, and process perspectives of
socio-technical model. As IS require interaction with people and technology,
so it is necessary to understand IS by focusing on the interrelation between
technology and its social environment. Socio-technical model is a good
approach for understanding, how IS is developed, introduced and become a
part of social practices. Our research is based on the following research
questions.

- How can implementation of HIS for the CMH be planned?
- How the socio-technical framework can be used to aid in the
  construction of an implementation plan?

Socio-technical framework helps in alignment of all the necessary factors
involved in implementation of HIS. These factors include structure of
organization, people working in an organization, current technology and
need of new technology, and processes that are conducted by people to
perform various tasks. An IS can not be implemented effectively until all
these factors are not properly aligned (Watson, 2007).

1.4 Research Aims and Objectives

The main aim and objective of this research is to make clearer the problems
that might occur before the implementation of HIS and the solution of these
problems. This study provides the main guidelines to cope with these
problems for implementing HIS effectively in a developing country setting.
Implementation of HIS requires various steps to accomplish it. This research
provides better understanding of how implementation of HIS could be
carried out by CMH, Muzaffarabad, Pakistan. It will help CMH in
construction of HIS implementation plan.

1.5 Justification

It is explained in above discussion that the management of CMH has no idea
for starting the implementation process. The problem they are facing is less
literature on implementation of HIS in developing country settings. This
research will help CMH management to understand the HIS implementation
in better way and guide them to plan the HIS implementation in CMH. So following are the main considerations of this research.

- To provide the better understanding of what hurdles might become trouble and how they will be removed before HIS implementation in a Combined Military Hospital (CMH), Muzaffarabad, Pakistan.

- To improve the understanding of implementation of HIS in developing countries.

1.6 Scope and Limitations

Health Information System is a broad topic and a lot of research has been made in health sector. It is very broad field and needs comprehensive study and time to explore the different issues regarding implementation of HIS. Limited time and resources has bound us to focus on only one issue that is exploration of problems and their solutions before implementation of HIS in CMH by understanding their current working culture.

The results of this research will contribute to the consideration that needs to be made, regarding implementation of HIS in developing countries. The findings of this study could not be utilized as it is by other hospitals because of difference between cultures of various hospitals. Though, they can use the results for understanding the problems before implementation.

This research will be effective in understanding the HIS implementation in developing countries settings because we have relied on socio-technical model for identifying the problems and their solutions before starting the HIS implementation. Socio-technical model has helped us in identification of problems by keeping social and technological factors in our mind. We have put equal focus on social issues as well as technological issues because these issues can influence the success or failure of HIS implementation.
2. Methodology Considerations

This chapter consists of an insight into the way in which this study is conducted. It includes a brief overview of the method, type, strategy, settings, data collection method, and how the empirical findings were analyzed. It further includes validity, reliability, and ethical considerations for this study.

2.1 Research Methodology

Kumar (2005, p.2) defines the research as “the way of thinking, examining critically the various aspects of day to day professional work, understanding and formulating guiding principles that govern a particular procedure, and developing and testing new theories for the enhancement of practice”. According to Creswell (2009), for conducting a research in good manners a research methodology is required. He further relates the research methodology with the questions like how the research design is implemented and how the research is carried out. Research methodology specifies following things.

- When and how often to collect data
- Construction of data collection measures
- Choice of strategy for contacting subjects
- Presentation of findings

2.2 Type of Research

According to Creswell (2009), there are three types of research which we can use for conducting research study. These are qualitative, quantitative and mixed method research. In this research, qualitative research method is used for answering the research question since the main aim is to explore and troubleshoot the problems before the implementation of HIS in the cardiology department of CMH. For this purpose we have to understand the current working style and culture of the cardiology department. Qualitative research approach is suitable for this research because we interacted with the employees of hospital to get their experiences, and ideas about their working environment and behaviors. As Myers & Avison (2002), stated the qualitative research approach is designed for the study of natural, social and cultural phenomena. The way in which people being studied understands and interprets their social reality is one of the central motives of qualitative research (Bryman, 1988). As mentioned above that we have to explore the problems before implementation of HIS, so we have to ask the selected employees of CMH about their understandings and meanings that they have attached to their working environment. Qualitative research is a naturalistic observable fact and it is concerned with understanding the meanings which
people attach to phenomena actions, decisions, beliefs and values within their social worlds (Denzin and Lincoln, 2000).

2.3 Research Strategy

According to Creswell (2009) for conducting qualitative study there are a lot of strategies to follow. These are ethnography, grounded theory, narrative research, case studies etc. Case study is selected for this research. The main reason of using case study is particularization, not generalization. We take a particular case and come to know it well in case studies. Case study provides the ways to investigate any problem in depth for its solutions (Stake, 1995). In this research, the people of only one department of selected hospital were investigated so the case study is appropriate strategy for this research. We were bounded by time and activity as Creswell (2009) describes case study as area where a researcher collects detailed variety of data through different types of methods over a constant period of time.

According to Yin (2009), a how or why question is being asked about a contemporary set of events over which the investigator has little or no control and for how and why question case study is good approach. The main question for this research is also a How question so case study is selected for deep understanding of phenomena. Yin (2009) has also described that there are three types of case study research. These are exploratory, descriptive, and explanatory. Sometimes researcher limits case studies to the exploratory use. Pilot case study could use to formulate questions or hypothesis testing. Descriptive case study could be used to measure or describe what happened to a product when it is launched. Explanatory case study research could be used to study the processes of any organization. Current research is based on single case study which is of exploratory nature because in this research, problems before implementation are explored and then by using the literature and theory, solutions are suggested to cope with these problems.

We have used socio-technical model for conducting this study. There are many methods which focus either on social or technical factors. Socio-technical model focuses on both social and technical factors. It is suitable for this study because we have identified the problems by interacting with the employees of CMH to get their experiences, and ideas about their working environment and behaviors. According to Wears and Berg (2005) existing health organisations are complex, composed of interdependent and interrelated social and technical elements. If changes are made in one element, it will affect the other elements. Introduction of any new technology for enhancing organizational structure and work processes, the attitudes and values of technology needs to be socially shaped. The socio-technical approach is one which facilitates in identifying the dynamics between technology, social factors, and cultural environment.
2.4 Research Settings
Cardiology Department of CMH, Muzaffarabad, Pakistan is selected for research. The key respondents of this research were the head of cardiology department, two main doctors and their personal assistants, two technicians and two nurses, who had been identified and considered as persons, possessing sufficient knowledge regarding the issues under investigation. The participants were identified after contacting the Head of Cardiology Department of CMH. He helped us by providing the e-mail addresses and contact numbers of all the employees of cardiology department to contact them for participation in data collection process. We have selected the participants on the basis of their computer and HIS proficiency. Head of Cardiology Department has encouraged his employees to co-operate with us in the data collection process. Time taken by this research is 3 months from mid-February to mid-May 2011. This research is mainly based on finding problems and their solutions before implementation of HIS in selected department of Combined Military Hospital, CMH, Muzaffarabad, Pakistan.

2.5 Data Collection Method
As it is discussed above that case study is selected as strategy and the qualitative research approach is adopted to conduct this research. According to Yin (2009), data collection for qualitative research include many ways like reviewing documents, archival records, interviews, direct observation, participant observation and physical artifacts. In this research interviews and documents of hospital are used as sources of data for data collection. There are various ways of conducting interviews, including structured, semi-structured and unstructured interviews (Minichiello et al., 1999). Interviews are used to get deep understanding of participant’s views and ideas regarding the research questions. According to Yin (2009) by conducting interviews, most relevant and accurate data could be collected for research purposes. Interviews can be conducted as face to face interaction, online interaction, email interaction, or phone interaction (Creswell, 2009). Semi-structured interviews are used in this research because Corbetta (2003) explains that semi-structured interviews allows interviewer to conduct the conversation as he thinks fit, to ask the questions he found suitable, to give clarification and ask for explanation if the answer is not clear, and to set up his own style of conversation. A productive conversation is possible when a balance of control is achieved which is provided by semi-structured interviews. The researcher can explain or ask the question in another way if the participants are unclear about the questions. For this study we have conducted online interviews of the participants by using Skype1. It is found fast and cheaper way of interviews for collection of data for this research as the participants are far away from us. Each interview has taken approximately 40 minutes and during this, notes were taken and interviews were recorded.

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1. Skype: Skype is a software application that is used to make audio/video calls over the internet.
During the interviews we have made some written notes and audio recording. While making the recording of the interview we have selected note taking procedure as suggested by Creswell (2009, p. 183) “I recommend the researcher to take notes in the event that recording equipment fails”. The data collection process of this study is shown in Figure 1.

Data is collected through semi-structure interviews and by reviewing the documents of hospital. During the interviews we have taken written notes and recorded the interviews. We have prepared the raw data on the basis of notes, recording and documents. After checking the validity and reliability we analyzed the formulated raw data.

2.6 Method of Analysis

According to Creswell (2009) data analysis is an ongoing process that involves continual reflection about the data, asking questions and writing memos throughout the study. Qualitative data analysis could be conducted concurrently with gathering data, making interpretations and writing reports. In this research, we have collected primary data through semi-structure interviews and for secondary data we have reviewed the documents of hospital. This study is conducted to understand the current working environment of cardiology department of CMH through experiences and ideas of participants. Therefore we have used hermeneutical method for analysis. The hermeneutical analysis has allowed us to look for the meaning of text, collected from interviews and documents of cardiology department.
for understanding the current working environment of particular department so that we can predict the problems that might occur before implementation of HIS (Ratcliff, 2008). After exploring the problems we have provided some suggestions in light of literature to cope with these problems so that implementation of HIS could be planned. According to Bleicher (1980), hermeneutics is theory of the interpretation of meanings. Hermeneutics is concerned with the meaning of text and it provide human understanding that what people say and do, and why. Hermeneutics attempts to make clear, or to make sense of, an object of study (Mingers & Willcocks, 2004).

While analysis first we have organized the data collected through documents and interviews and prepared it for transcription. Then we have transcribed all the raw data from interviews. Afterwards, we have carefully read all the transcribed data and categorized it in different categories to find patterns. With this we have created different themes and subthemes from the data, and then we have interpreted the meanings of these themes and categories as shown in figure 2. We have adopted this way for analysis as it is suggested by Creswell (2009) that it is good approach while conducting qualitative study to get deeper understandings of textual data. We have provided the meanings in next chapters after understanding the problems and while providing solutions for these problems.

![Data Analysis in Qualitative Research](Creswell, 2009, p. 185)
2.7 Validity and Reliability

The quality of qualitative research is a serious and a debatable topic in social science. Due to this issue we have maintained reliability and validity of this research by using multiple strategies of validity. It helped us in assessing the correctness of findings of this research. Creswell (2009), influenced by Gibbs (2007), has explained qualitative validity as the researcher check for the accuracy of the findings by employing certain procedures and qualitative reliability as the researcher approach must be consistent across different researchers and different projects. Creswell (2009) has explained different procedures for reliability and validity which include triangulation strategy for validation, member checking strategy, rich thick description, and peer debriefing etc.

We have checked the validity and reliability to measure the accuracy of findings of this research by using one of the mentioned strategies. We have adopted member checking strategy for validity and reliability checking. We have formulated themes and descriptions on the basis of collected data and sent these descriptions to participants via email. After their response we have determined that the themes and descriptions are valid and reliable. According to Creswell (2009), if themes are established based on joining several sources of data, then this process claims validity in study.

2.8 Ethical Considerations

Ethics is a branch of philosophy that deals with the analysis of decisions and actions with respect to their appropriateness in a social context. Ethics is applied to many different issues in Information Technology (IT) and IS, correspondingly to other managers, teachers and students in industry and academics (Lewis, 1985). As this study is basically for the fulfillment of master’s thesis so while writing thesis various ethical issues aroused at different stages of work. Mainly respondents in research work are humans so ethical considerations are necessary to ensure the privacy and safety of participant.

In this research we have carefully selected various ethical considerations. We have clearly explained the purpose of this study to participants. The selected questions for conducting interviews were adopt-able to the interviewed individual. We have assured their understandability while conducting interviews. Participants were given the opportunity to speak freely and inquire anything about the questions during the interview. The most important thing which we have considered for this study is assuring them that participant can withdraw at any time during the interview and we will not insist any participant for answer. We have made the audio recording of the interviews during data collection and we have informed the participants about this.
3. Theoretical Framework

This chapter includes a brief introduction of Information system (IS) and its main components according to the socio-technical approach. It further includes some information regarding IS implementation in general, IS in health sector along with its implementation, HIS in developing countries and implementation of HIS in small unit.

3.1 Information System

Information System (IS) can be technically defined by Laudon & Laudon (1991) as a set of unified components working together to collect, retrieve, process, store, and disseminate information to facilitate the planning, control, coordination, and decision making in any organizations. An IS is a system that includes data, processes, policies, protocols, skill sets, hardware, software, responsibilities and some social factors for fulfilling the aims of circulation of information throughout the whole organization or business to enhance its efficiency and performances (Watson, 2007). In this era of Information Technology (IT), most of the organizations are involving IT in their culture and functioning. The main reason of involving IT is to make any organization more and more competent in information sharing so that it can survive and meet the challenges like efficiency and competitiveness (Swanson, 1994). According to Heeks (1999), an IS is combination of IT, information itself, people and management. An IS could not be considered as successful in supporting reform until all these components are succeeded. Watson (2007) has discussed that successful IS comprises technical and social components according to socio technical approach.

3.1.1 Components of Information System

As discussed above, IS can be seen to have social and technical subsystems. Social system comprises two components which are structure and people. Social system can also be termed as culture of organization. Technical system comprises technology and processes. When all these components will be present and working parallel with a proper balance between them then we can say that the working system is efficient IS. So it is valid to say that an IS must have following four components (Watson, 2007). These are structure, people, technology and processes as shown in Figure 3.

![Figure 3: The Socio-Technical System (Cited in Watson, 2007)](image-url)
Structure
Watson (2007) has explained the structure as organization itself. It is also referred to the relationships between the people (employees) of organization. It includes categorized and top down hierarchies of office structures, and also clarify the directions for the flow of information within and outside the organization. Structure is one of the important components of any IS. Watson (2007) states that while introducing the new system in organization it may fail because of the resistance of the intended users. The resistance towards the change is natural and inherent behavior of people. According to Kotter (1996), for a change process, there is no surety of its success and it is a slow process to bring new system to replace working structure of organization. To avoid such sort of resistance from the intended users Watson (2007) has proposed that there is a need of making motivation among the people so that they should welcome the change in system. Kotter (1996) has also focused on motivation by creating a clear vision regarding change and then properly communicating this vision among people so that they can see the clear picture of future. Watson (2007) proposed a way of achieving motivation by announcing some current and future bonuses or reward systems in organizations. It will ensure the success of new system in organization.

People
According to Watson (2007) people component includes all the individuals who are directly involved with the system. It means the users of the system who will directly interact with the upcoming system. These people include the managers, assistants, clerks and simply speaking all the employees of organization who are supposed to interact with the system. As it is discussed above that new system could fail if people factor is not given the importance it deserves. So, people are also considered as important factor of any IS because for a successful IS the people must be having enough skills, positive attitude and interest towards the system. Watson (2007) further emphasized that while designing a new IS, the structure, people, technology, and process factors must be considered for the success of project. People or users must be provided with enough time, trainings and awareness to get used to the system. According to Baus (2004), the knowledge and skills of employees of any organization can be improved by training and awareness programs.

Technology
According to Watson, (2007) this factor includes IT. IT is used by all the modern organizations for achieving the IS. As today is the era of IT so it is also an important component of IS for any organization. Without relying on IT, organization cannot achieve the main goals which they aspect from IS. Markus and Robey (1988) termed technology as a force which determines the behaviors of individual and organization. The relationship between IT and organizational change is a central-concern in the field of IS. Watson (2007) has discussed that in any IS, the IT includes hardware, software and
telecommunication equipment. Hardware means to add computers, printers, scanners and other computer related components. Software means the specially designed computer programs to assist the hardware for fulfilling the tasks within information systems. The most important is telecommunication which includes different networking equipment to make Local Area Network (LAN) or inter organizational network for information sharing. Simply speaking the telecommunication equipment is used to allow all the people and machines within the organization to communicate with each other (Watson, 2007).

**Processes**

A process includes all the steps that are taken to complete any of the tasks or activities in organization. Watson (2007, p. 21) has defined the process as, “a process maps the set of actions that an individual, a group or an organization must enact in order to complete an activity”. The most important thing about the process component is its relevancy to the other components. It means that while designing any process, one thing must be kept in minds that it should fit with all other components like structure, people and technology (Watson, 2007).

Technical and social factors are conceptually shown in figure 3. The relationships between the technical and social factors are drawn with the help of four components. These four components are structure, people, technology and processes. Each of the four components can result in the success or failure of an IS. According to Kotter (1996), social factors are more critical than the technical factors while implementation of new system in organization, as people can play a vital role in success or failure of any change process. While comparing technology, processes and people factors, Watson (2007) has stated that the best software application for conducting any organizational process will yield little result if users reject it and fail to adopt it and this will result in failure of IS. The four components of IS need to work together for the success factor. Watson (2007) further explained that when the organization decides to bring in a new technology to support its operation, the design team must adjust the existing processes. The people must be involved and trained to make sure that they can carry out the processes. If the structure of organization needs to be modified for new system implementation then it must be modified. The above discussion shows that both social and technical factors are important for success of IS but people (user) component of social factor is considered as the most important factor that can play a vital role in success or failure.

**3.2 Implementation of Information System**

IS is implemented in the organizations for enhancing the efficiency of the organizations. The implementation of IS is considered as interesting topic for the practitioners as well as researchers since last two decades (Watson, 2007).
As IS is a socio-technical system, it requires the parallel implementation of IT and human activity. Implementation of IS involves both social and technical implementation. Social system implementation involves that proper users are selected, trained and supported in use of technology. Technical system implementation involves the hardware, software and data (Davies, 2002).

3.2.1 Ways for system implementation

According to Davies (2002) there are three major ways for system implementation. These are direct conversion, parallel and hybrid implementation approaches.

Direct conversion approach is also called “big bang” implementation. With this approach, on a single date the new system directly replace the old system. This is also called the changeover of the system. When the changeover is done, everyone starts to use the new system at the same data as there is no overlap between the implementation of the new system and the replace system.

Parallel Implementation approach is used in large organizations where old and new systems run in parallel. To reduce the risk both systems run at the same time for some period of time. If problems are experienced the organization moves to the old system, so that problems in the new system will resolve. If the new system meets the criteria the organization then disabled the old system. This process requires proper planning and control.

In hybrid Implementation approach, the implementation is done in phases. After the completion of each phase the system is getting closer to be fully adopted by the organization. It is an evolutionary approach as the implementation is distributed over time then in direct conversion.
3.2.2 Socio-Technical System Implementation

According to the socio-technical approach, an IS must be implemented in two parallel phases (Davies, 2002). These are technical system implementation and social system implementation. Both phases are shown in figure 5.

![Diagram of Technical and Social Implementation (Davies, 2002, p. 374)]

As far as technical system is concerned, it involves following stages for its implementation respectively:

- **Software acquisition**
  
  In this stage the decisions regarding software acquisition are taken. Software may include operating systems, data base management systems (DBMS) and related application software.

- **Hardware acquisition**
  
  In this stage hardware acquisition is done. It includes the purchasing of computers, peripheral devices, and telecommunication equipment.

- **Data preparation and conversion**
  
  In this stage data is prepared for transfer. Because when new system replace old system there must be transfer of data from the old system to the new system. For this data must be prepared for transfer.

- **Installation**
  
  In this stage the installation of hardware, software and entering of relevant data in to the system is done.
• Testing

In this stage the testing of system is done to ensure, either the system works effectively or not after the complete configuration.

• Delivery

After completion of testing phase the last stage is delivery of system. In this stage the developed system is delivered and fully introduced to the organization.

Social system implementation is the second phase that is required for implementation of IS. It involves following stages:

• User group formation

In this stage the user groups are formed. These user groups include the appropriate users who will use the system.

• User and operator training

This stage includes the training of users. Training plays an important role towards the proper use of system. For this purpose, the developer or a user who is an expert in the use of system is then required to proper train the users who will use the system.

• User acceptance

After proper training of the user groups, the system is accepted by the user group. Part of this will be some acceptance testing.

3.3 Success and Failure rate of IS

We have found different facts regarding success and failure rates of IS projects while studying various resources. There is no exact figure that can be used to express exact failure and success rate of IS projects. Wright & Capps (2010) has discussed that a lot of money is spent on IS management but still no remarkable success is encountered. United Stated and United Kingdom financial investments for obtaining IS management are discussed by Wright & Capps (2010). Both these are developed states but still they did not achieve expected success in this regard. In 1995, Standish Group International revealed that only 16% of IS projects were finished within the estimated budget and time; 32% were dismissed before the completion and the remaining 52% exceeds the estimated costs and were completed behind their schedule. A 2004 Standish Group report estimated a success rate of 29%, with 53% of the projects having problems, and a failure rate of 18%. The Standish Group's 2009 report shows that 32% of IS projects succeeded, where as 44% were problematical and 24% unsuccessful (Standish Group,
1995, 2004, 2009 cited in Wright & Capps 2010). Wright & Capps (2010) has summarized all the failure rates and success rates by explaining that 20% to 30% of all IS projects are observed as fully failed, while 30% to 60% are partially failed. We have discussed about IS, IS components, IS implementation according to socio technical approach and its success and failure rate in general. Now, role of IS and its implementation in health sector is discussed below.

3.4 Information System in Health Sector

IS is generally designed to encounter particular purposes. Every field is trying to adopt the IS for improvement in their current working status and to bring efficiency in their operations. One of the most important fields is healthcare. It is considered as a complex field while providing services to the people because it involves the organization and involvement of many professionals. This organization and involvement of professionals means proper sharing of information about patients between healthcare workers. It is a very complex task for the workers in the health sector to share bulky paper based patient information between different sites and physicians. The solution is to achieve the sharing of information through computer based IS in health sector (Eason, 2010).

In short, IS in healthcare can enhance the quality of work and promote improved patient care. The ideal IS for healthcare sector, however, does not yet exist. Furthermore, what is ideal within one healthcare setting may not be deemed so in another and what is considered to be ideal may change over time (Baus, 2004). Ammenwerth et al. (2004) stated that healthcare sector without IS based on Information Technology (IT) and related applications for gathering and sharing of clinical information are unimaginable. Moreover, the administrative, financial and clinical features of a hospital can also be well managed through a complete and unified Clinical Information System which is also termed as Hospital Information System (HIS). Berg (2001) has said that the main goal of HIS is to attain the best potential support of patient care and administration by electronic data processing. It is one of the enormous features of HIS that management can access the required information at right time for effective and efficient decision making. Berg (2001) has further said that HIS can help in improvement of patient care by accessing data and it enables a hospital to move from retrospective to a concurrent review quality and appropriateness of care. After introducing HIS in hospitals, it is seen that improvement in hospital management and patient care is achieved. Moreover, it reduces the treatment cost for patients and it has enabled the doctors to spend less time for retrieving the accurate patient records (Sagroglu & Ozturan, 2006).

Over the last few years, cost of high quality services and patient satisfaction has enormously increased and the best solution to cope with these issues is HIS. HIS ensures the patient satisfaction, improve hospital processes and to provide high quality services with reduced cost. HIS implementation in
hospitals is considered to be complex as compared to the other information systems in other different organizations. Sagroglu and Ozturan (2006) has stated that system infrastructure design, requirement specification, master data collection and definition, integration with other systems, localization, training, and final system test are the main activities of implementation phase of HIS.

Sagroglu and Ozturan (2006) has drawn from the work of Ash et al. (2004), Ball (2003), Berg (2001) that there are some difficulties which may come across during the implementation of HIS. A hospital may face many difficulties in the implementation process of HIS. Sagroglu and Ozturan (2006) have pointed out the following areas to be concerned with the implementation of HIS:

- Lack of information about HIS implementation
- Ignorance of administrative needs of hospital
- Infrastructure and planning of implementation process
- Balance between different departments and end users
- Redundancy and inaccuracy of master data

There are also some recommendations which Sagroglu and Ozturan (2006) has discussed. These are:

- Requirements of stockholders should be properly understood and then proper planning should be started
- Failure and success factors from others should be considered
- Proper training of the user groups should be ensured for successful implementation of HIS
- Training of doctors, nurses and department secretaries must link the IS to actual clinical settings.
- There might be some resistance from the doctors towards the system and it can be overcome by proper motivation to use the systems
- End users should be involved in the implementation
- While implementation of HIS, hardware infrastructure planning must be effective

The structure and culture of an organization have deep effects on the implementation of any project within an organization. According to Wanyama and Zheng (2010), organizational culture can help in drawing the linkage between the technology adoption and organizational growth. The
main and important requirement for IS implementation is to gain better understanding of organizational culture and how it facilitates or bounds the implementation process of an IS. To gain better understanding of IS development, implementation and its uses; the important thing is to comprise a better understanding of how people actually work, social practices, and the culture of organization. Wanyama and Zheng (2010) have further explained that culture has a dominant effect on employee’s attitudes towards job satisfaction and commitment to the organization and their talent or readiness to adapt and perform well.

According to Houser et al. (1984), any hospital wishing to implement an IS must effectively work through the change process to achieve positive outcomes. The implementation of a HIS needs numerous elementary tasks to be performed. These include site preparation, environmental factors, a project team, implementation and system testing. It further requires the staff willingness, relevant software and installation of sophisticated high technology. Implementation of HIS in any hospital can be lead to success by proper change process. Change process plays an important role in introducing new IS in any organization (Houser et al., 1984).

Kotter (1996) has described that for successful implementation of IS, first the organization create a sense of urgency, powerful coalition creating a vision, communicating the vision, empowering others, planning for short-term wins, and institutionalizing new approaches as the most important factors leading to thriving implementation. Kotter (1996) mentions that the most common factors to control the success of implementation is the managerial skills to manage the transformation and communication during this transformation. Two factors are involved for HIS implementation through change process these are social and technical factors. Social factors are more critical than the technical factors, as people that have to be the part of major change.

Kotter (1996) has further described that the change process takes much time for its success. It is also clearly described by the Rogers et al. (2003, p. 104-105) by quoting this “Rome wasn’t built in a day”. According to Rogers et al. (2003) change takes time and if we move too fast, our best people will leave and we will end up with worse results. From all this discussion, the success of implementation of HIS can be assured if there will be some changes which have to be made in the Hospital before implementation, so that the implementation may be useful and successful. There are some important factors which may assure HIS implementation to be successful or become responsible for the failure of implementation process of HIS. Baus (2004) has described these factors in light of the socio-technical approach.
According to Baus (2004), the factors that are responsible for success or failure of HIS implementation are usability, leadership, technology, organizational structural change, and training and training support.

• **Usability**
  
  Before introducing HIS into a hospital settings, there must be redesigning the way the office works (Baus, 2004). For providers and staff to adequately learn how to use the new system, they must be provided with time, training, and financial investments.

• **Leadership**
  
  Strong leadership in support of the implementation of HIS is crucial in successful implementation. According to Wager et al. (2000), the leaders are referred to healthcare professionals who are committed to use the HIS to improve quality of care. Baus (2004) has explained that the leader in support of the HIS understands the impact that this new healthcare IT has and may increasingly have on healthcare delivery, while also understanding how to manage this impact.

• **Technology**
  
  Technology facilitates successful implementation of HIS. Hersh (2002) explains that healthcare sites must have the appropriate technology and infrastructure to start the implementation process. Baus (2004) has stated that the lack of IT in implementation of HIS is major hindrance. Terminology for technology must be made regular to guarantee the meaning of the terminology.

• **Organizational Structure Change**
  
  Baus (2004) explains that in some cases the organizational nature of HIS implementation is more important than its technical components. HIS can modify the working relationships between the people working in the hospital and it has positive effect on the ways in which hospital staff work together provide health care, and carry out their daily work practices. According to Wager et al. (2000) the impact on the organizational structure must be understood before the successful implementation of HIS.

• **Training and Technical Support**
  
  A hospital may not achieve the necessary goals only by implementing HIS. Such system cannot work properly until proper training is provided to the people who will use this. On-site technical support and trainings is must for user so that they can feel comfort while using the system successfully. Before implementing the HIS, make sure that the requirements of the physicians will be fulfilled by new system. When
implementation of new IS is completed then for the success, proper training is required to reduce failure rate (Baus, 2004).

Baus (2004) has stated that Socio-technical approach enforce that the design of the HIS must be shaped in the region of unique requirements of the clinical setting. Berg (1999) has explained that the socio-technical approach offers attention to the social, or human, variables that have a noteworthy impact on the success of HIS. Users must be involved during the designing phase of HIS. According to Kyng (1994) the involvement of user is a Scandinavian approach for better understanding and fruitful results.

Socio-technical approach is an integrated approach which demonstrates that the technical and social considerations are to be intimately linked. This approach does not treat the present, traditional condition of clinical healthcare as unorganized and is required to repair. Instead it attempts to contribute and reinforce areas of already existed patient care system (Baus, 2004).

According to Berg (1999), socio-technical approach does not order to use electronic medical record as a substitute of the traditional paper medical record but it stresses the use of HIS as a tool having potential for important developments in the excellence and accessibility of the patient records and monitoring health status. Baus (2004) explained that any change in healthcare sector takes place in combination with the present skills, methods and positive approach.

3.5 HIS in Developing Countries

There are a lot of studies made on the topic of HIS. On behalf of the results and development plans, we can say that there is a need for reinforcement of hospital management IS. It is proved as a difficult and tough task, especially in developing countries because of organizational complexity, partitioned and clumsy organizational structure, unrealistic ambitions and sustainability issues (Braa et al., 2007).

An IS may fail or it can be successfully implemented in any environment. In both developing and developed countries the research contains success and failure issues. In the famous papers entitled “Leading Change” and “Crash” by Kotter (1996), and Collins and Bicknell (1998) respectively, they have listed the main issues related to the results of implementation of ICT projects.

Kotter (1996) emphasized on the factors like sense of urgency, powerful coalition, creating a vision, communicating the vision, empowering others, planning for short-term wins, consolidating improvements and anchoring new approaches in culture. These steps can also lead to the successful implementation of HIS.
Collins and Bicknell (1998) have tried to explore the failure factors and found out that the main failure factors during implementation process are complacency, over-rating of the computer technology, over ambition, over reliance on ICT professionals and ICT consultants, excessive confidence in the power of the contract to penalize an underperforming ICT company and trust in costly custom built software. The technology is playing a vital role in healthcare sector of developed countries as well as developing countries. It has ability to improve both the clinical and management operations of hospitals.

Malik and Khan (2009), influenced by Kotter (1996), and Collins and Bicknell (1998), have suggested that for leading successful implementation of IS in any organization there must be some change process. Malik and Khan (2009) have explained that the developing countries are facing problems to get benefits of ICT in health sector. The success rate of HIS implementation is very low in developing countries. There are scarce examples on successful implementation of HIS in developing countries as compared to developed countries. In developing countries the studies from the developed countries cannot be utilized as guideline for the implementation process because in both, the working culture and circumstances are different.

In other developing countries like Bangladesh where the government is working on basic health services for its people, there is limited knowledge about the status of HIS and some projects in relation to IS in health care. Bangladesh is using some innovative technologies to solve these problems and achieve better health outcomes in the country. Anon (2009) says that while HIS implementation, Bangladesh is facing problems like lack of ICT literature, limited financial resources to buy latest technology (computers), recruitment of ICT staff, poor record keeping and expensive ICT connectivity.

Similarly in Belize, Ethiopia, Ghana, Haiti, Indonesia, Kenya, Mexico, Mozambique, Peru, and Rwanda there are various problems regarding HIS. All these countries are facing critical HIS challenges. These challenges include data collection problems, lack of skilled staff, poor equipment, poor infrastructure, inadequate funding for ICT, policy standards and development national automated HIS. They are trying to cope these issues and working hard to improve the health care (Anon, 2009).

Regarding the failure and success rate of HIS in developing countries, Heeks (2002, p. 102) states, “There is no evidence, nor is there any theoretical rationale, to support the idea that failure rates in developing countries should be any lower than those in industrialized countries. Conversely, there is evidence and there are plenty of practical reasons—such as lack of technical and human infrastructure—to support the idea that failure rates in
developing countries might be higher, perhaps considerably higher”. It means that the evidence of IS success and failure rate in developing countries is very limited. The available studies emphasize on factors rather than rate of success and failure.

E-healthcare is referred to the 21st century healthcare. It offers additional services such as hospital information system, electronic health record, and telemedicine. In order to understand the HIS implementation, challenges regarding e-health are also to be considered. According to Omary et al. (2009) many countries from both developed and developing settings, know the possible advantages of implementing e-healthcare but there are various challenges to be tackled prior to its adoption. These challenges differ in developed and developing countries. Omary et al. (2009) explained that developing countries have lack of funds, low rate of internet usage, low bandwidth, lack of healthcare rules and regulations, lack of acceptable privacy, and security concerns. Igira et al., (2007) stated that organizational structure is also a big challenge while designing HIS. On the other hand Igira et al., (2007) further described that developed countries such as Canada, Singapore, USA and UK had invested enormous amount of money for motivating e-healthcare acceptance while developing countries still depends on the traditional healthcare systems. Huge investment by developed countries is inspired by the problems related to the traditional healthcare setup such as repetition in patient’s records, more time consumption while formulating new patient’s records and rise in cost of providing patient care due to manually conducted procedures. From this discussion it can be said that main challenge which become hindrance in the way of implementation of HIS in developing countries as compared to developed countries is lack of funds and motivation.

3.6 Implementation of HIS in small unit

After reviewing the paper of Malik and Khan (2009), it is valid to say that instead of implementing HIS at large scale, it is better to start implementation from a small scale. They conducted a qualitative case study of Pakistan Institute of Medical Sciences (PIMS), Islamabad. PIMS is a large public sector hospital in Pakistan that has successfully implemented HIS. This case study was conducted to understand that how PIMS has successfully implemented HIS in developing country settings where few examples exist.

The idea of HIS was first arise in 1996 but the top management at that time did not show any interest. Due to less budget and low quality ICT infrastructure, PIMS have decided to implement HIS only in small unit instead of whole hospital. They selected pathology department for this purpose. The HIS was successfully designed and deployed in pathology department. Both the traditional and computer based systems work parallel for long time. Then trainings of employees were done by IT staff. In
pathology department the HIS become successful because employees were satisfied with this system. The head of pathology department has discussed this with the head of radiology department. After the success of pathology department regarding HIS implementation the radiology department has also shown willingness to adopt this system. This was successfully deployed there also. When the success of both these department were seen by other departments they also showed interest. There was a barrier to implement it in whole hospital. This barrier was due to some doctors and nurses who had no idea of HIS. But when they have seen the benefits of HIS in pathology and radiology department, they got motivated and now the work on implementation of HIS in whole hospital is ongoing. It is clear that success can be achieved by implementing HIS in small units (Malik & Khan, 2009).

In above discussion the main theme discussed is that the implementation in small unit is more successful as compared to large units. In other examples it was seen that implementation of HIS did not meet the expected results because the implementation was tried at large scale.
4. Empirical Findings

Objective of this chapter is to present the empirical findings obtained from the answers of interview questions asked by 9 selected participants of cardiology department of CMH as shown in Table 1. This chapter will present the collected data and results according to socio-technical model.

4.1 Data Collection

The data was collected from employees of the cardiology department of CMH through online interviews. Interviews were conducted by using Skype. We have contacted participants through telephone and scheduled the interviews with them according to their preferences in order to collect data for this research. In Table 1, we have shown the names, responsibilities and experiences of the selected participants. Combination of Alphabet and Numeric symbols are used to represent each participant. In below table ‘P’ alphabet shows the participant and then numbers are used to distinguish between them. Instead of using names, we have used P1, P2, . . . . P9 to represent the participants in tables in which we have shown main ideas of their answers against each question asked during the data collection. We have collected data by conducting interviews and asked the questions according to four perspectives of socio-technical model to understand the present working culture and condition of cardiology department. The questions according to each perspective are presented in Appendix A. The questions which were not relevant to ask from any particular participant are represented as N/A in the tables.

<table>
<thead>
<tr>
<th>Participant</th>
<th>Name</th>
<th>Job Title</th>
<th>Total Exp. (In Years)</th>
<th>Exp. in CMH (In Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>Dr. Waqar Haider</td>
<td>Head of Department</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>P2</td>
<td>Dr. Latif-ur-Rehman</td>
<td>Heart Specialist</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>P3</td>
<td>Dr. Pervaiz Rathore</td>
<td>Medical Specialist</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>P4</td>
<td>Irfan Shah</td>
<td>Personal Assistant</td>
<td>05</td>
<td>05</td>
</tr>
<tr>
<td>P5</td>
<td>Jamshed-ur-Rehman</td>
<td>Personal Assistant</td>
<td>07</td>
<td>07</td>
</tr>
<tr>
<td>P6</td>
<td>Shehnaz Batool</td>
<td>Head Nurse</td>
<td>15</td>
<td>08</td>
</tr>
<tr>
<td>P7</td>
<td>Sarah Kaleem</td>
<td>Nurse</td>
<td>07</td>
<td>04</td>
</tr>
<tr>
<td>P8</td>
<td>Bashir Khan</td>
<td>Senior Technician</td>
<td>12</td>
<td>09</td>
</tr>
<tr>
<td>P9</td>
<td>Nasir Bukhari</td>
<td>Technician</td>
<td>08</td>
<td>05</td>
</tr>
</tbody>
</table>

Table 1: Participants
4.2 Results of Interviews

We have conducted interviews to collect data for this research work and during the interviews we have asked various questions to understand the current working environment of cardiology department of CMH. According to the socio-technical model we have grouped our questions in four categories to better understand the current condition and working culture of cardiology department. These are structure, people, technology and processes. We have collected data according to these perspectives and below are the results of collected data. In results we have also included some information from the documents of hospital which is our secondary data source. Secondary data has helped us to understand the ways in which they conduct different processes related to health care. It has also helped us to get idea of information flow between employees. The documents that are accessed as secondary data are shown in Appendix B.

4.2.1 Structure

Regarding structure of cardiology department of CMH we have asked 12 questions from the participants. We have compared all the answers on the basis of similarities and dissimilarities against each question and then formulated the themes and descriptions as shown in table 2.
<table>
<thead>
<tr>
<th>Participant / Question</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
<th>P8</th>
<th>P9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Structure</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q. 2 Top Down Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
<td>Top Down</td>
</tr>
<tr>
<td>Q. 3 Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
<td>Two Ways. Both top down and bottom up.</td>
</tr>
<tr>
<td>Q. 5 Sometimes but only for suggestions.</td>
<td>Not involved but we take suggestions</td>
<td>Sometimes for getting suggestions.</td>
<td>Not directly involved but only for suggestions.</td>
<td>Only ask for suggestions.</td>
<td>Sometimes they involve but mainly they just ask for suggestions.</td>
<td>Not involved.</td>
<td>Only for suggestions.</td>
<td>Not involved.</td>
<td></td>
</tr>
<tr>
<td>Q. 7 Sometime given importance but mainly not. It depends on matter they suggested.</td>
<td>Sometimes given importance but mainly not. It depends on nature of decision.</td>
<td>Depends on the nature of suggestions.</td>
<td>Mostly ignored.</td>
<td>Mostly ignored.</td>
<td>Given no importance but sometime they appreciate some of the suggestions.</td>
<td>Not given importance.</td>
<td>Sometimes given importance but mostly not.</td>
<td>Sometimes given importance but mostly not.</td>
<td></td>
</tr>
<tr>
<td>Q. 9 Current system become time consuming as workload increases.</td>
<td>Workload makes this system inefficient sometimes.</td>
<td>No deficiency.</td>
<td>Failure of good patient care as workload increases.</td>
<td>Managing patient’s records is problem when workload is maximum.</td>
<td>No deficiency.</td>
<td>Current system is time consuming in case of daily reporting.</td>
<td>Making Patient’s reports become trouble when workload is high.</td>
<td>Current system takes a lot of time in creating and maintaining the inventory of all things.</td>
<td></td>
</tr>
<tr>
<td>Q. 10 To improve patient care and administrative processes. To achieve the cost effective, good quality patient care.</td>
<td>To improve administration, patient care, finance and decision making process.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q. 12 Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes but if I will be able to work in it other wise I will prefer current system.</td>
<td>If new system will provide ease during my job. I will accept it.</td>
<td>If job security and time will be given to adapt new system then I will accept it.</td>
<td>If will be given job security then I will accept new system.</td>
<td>I need job security to accept new system.</td>
<td>I will accept it if it will be helping in my routine tasks and I will be able to work in new system.</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Structure perspective
On the bases of the collected data through the interviews and from the documents of cardiology department of CMH, we have got a picture of the structure of cardiology department of CMH. The current working environment of cardiology department is Paper Based (Manual). All the documentation which includes daily reports, patient records, schedules, inventories are done on papers. Traditional paper based system is playing an important role in the current working environment of cardiology department. The current hierarchal structure of cardiology department is top down. Top down structure allow the highly skilled individual to direct the flow of work most effectively. In the current working environment the flow of information is from top to lower management and from lower to top management. Both top down and bottom up approaches are being used for information sharing. The top management is responsible for any kind of decision when it comes to patient care, finance and administration. The top management includes general duty medical officer, head of department and doctors. They take all kind of decisions. During the decision making process the top management of cardiology department does not involve the lower management. Most of the times they ask lower management for suggestions but at the time of decision they ignore their suggestion. During the interview one of the doctors who are in top management said that we do not involve any lower management is decision because we know what is best for them. When the top management has decided to implement HIS in cardiology department to replace current system they did not discussed it with the lower management. Employees of cardiology department are satisfied with current system but only top management thinks that it needs improvement. They think that the automated system will improve their working environment, provide cost effective and quality patient care, and it will provide ease to their employees. Almost all of the employees have explained that they experienced some problems with the current system. These problems are inefficiency, time consuming in case of reporting when workload increases. During the interview we also found that most of the employees of lower management are more involve in reporting and managing important tasks and that’s why they face these problems. Regarding the acceptance of new system many employees have shown resistance. They have fear of losing their jobs it means they have job security concerns. They are also worried about the fact that either they will be given proper time to learn and adjust themselves in new system or not. Everyone is in dilemma that what will happen if they will not become able to work in new system.

4.2.2 People
According to this factor we have asked 5 questions from participants and did the same procedure to conclude the final meanings of all answers as we did in the structure part. The findings regarding people factors are shown in table 3.
<table>
<thead>
<tr>
<th>Participant / Question</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
<th>P8</th>
<th>P9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>People</strong></td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
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<td>Q. 13</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regarding new System (HIS), employees do not possess much knowledge and skills.</td>
<td>No idea regarding employees skills regarding new system (HIS), but in current system they are competent.</td>
<td>No idea of employee’s skills regarding new system but basic computer knowledge is sufficient for the new system.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td></td>
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<tr>
<td>Q. 14</td>
<td></td>
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<tr>
<td>Basic computer knowledge and can easily use it. Experience of HIS.</td>
<td>Proficient in using computers and have experience of HIS.</td>
<td>Good in using computers and also having experience of HIS.</td>
<td>Good in using computer, only can use MS Word and MS Excel.</td>
<td>Good in using MS office but no experience of HIS.</td>
<td>Proficient in using MS office and internet.</td>
<td>Can use MS Word and MS Excel.</td>
<td>Good in MS Word and MS Excel but no knowledge about computer technicalities.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q. 15</td>
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<td></td>
</tr>
<tr>
<td>Not all employees but few are provided. Mainly top management people.</td>
<td>Yes.</td>
<td>Yes.</td>
<td>No.</td>
<td>No.</td>
<td>Yes (For reporting and scheduling).</td>
<td>No.</td>
<td>No.</td>
<td>No.</td>
<td></td>
</tr>
<tr>
<td>Q. 16</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>I possess good knowledge of HIS but not enough knowledge about IT.</td>
<td>Regarding HIS, good working experience but little knowledge about IT.</td>
<td>Good experience of HIS but regarding IT, not sufficient knowledge.</td>
<td>Regarding IT, sufficient knowledge but no knowledge about HIS.</td>
<td>No knowledge regarding both IT and HIS.</td>
<td>No knowledge regarding both IT and HIS.</td>
<td>No knowledge regarding both IT but little know how about HIS.</td>
<td>No knowledge regarding both IT and HIS.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Q. 17</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Only asked to Head of Department). Almost all key employees will use this system. Users will be HOD, Doctors, and Personal Assistants of doctors, Head Nurse, Other Nurses, Technicians, and other administrative members.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3: People perspective
Regarding the people factor, most of the employees of cardiology department do not possess sufficient knowledge about HIS. Employees at top management has some practical experience and knowledge of HIS but on the other hand the employees from lower management side do not have knowledge as well as practical experience of HIS. Some of them know very little about HIS and some do not know anything about it. The reason which we have found is because the employees at lower management have never been worked in any automated environment where any computerized system has been used for patient care. The employees at top management know about HIS because many of the doctors has did specialization and got medical education from abroad where they also got chance to interact with automated systems. Most of the employees of cardiology department possess basic computer knowledge and one of the doctors has said that if employees have basic computer knowledge then it will be sufficient for working on HIS. In cardiology department the employees at lower management are still not provided with computers and internet to support their routine tasks. Only top management is provided with computer and internet. The only employee who is provided with computer, at lower management is Head Nurse for making reports and scheduling. The rest of employees at lower management side do all the tasks manually. Even employees at top management also work manually and they are using computers for only sending and receiving e-mails, and sometimes for searching data regarding any problem. Almost all the employees of cardiology department are not so familiar with IT. They have no idea of how IT can play role for their routine tasks. Some of the top management employees have satisfactory knowledge regarding IT. On the whole, the employees of lower management are not familiar with HIS and IT but employees of top management have satisfactory knowledge of IT and good knowledge of HIS.

According to top management the future users will be head of department, doctors, and personal assistants of doctors, head nurses, other nurses, technicians, and other administrative members. It means that after implementation of HIS, the employees from both top and lower management will be the users of a new system.

4.2.3 Technology

For collecting data regarding technology factor we have asked 5 questions from participants concluded the final meanings of all answer against each question. The results are shown in Table 4.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Question</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
<th>P5</th>
<th>P6</th>
<th>P7</th>
<th>P8</th>
<th>P9</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Technology</td>
<td>No, but we get services from a local computer supplier when required.</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Q. 18</td>
<td></td>
<td>Yes, for Doctors and Head Nurse.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, only for doctors and Head Nurse.</td>
<td>Only senior people are provided with computers.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Q. 19</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, only for doctors and Head Nurse.</td>
<td>Only senior people are provided with computers.</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Q. 20</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Q. 21</td>
<td></td>
<td>Main use of computers and internet is sending receiving email. Main use of internet is in operation theatres for getting online help during any operations.</td>
<td>Sending and receiving e-mail, for searching articles and journals across internet to keep my self updated.</td>
<td>For making monthly reports, sending and receiving e-mails, and for searching important information regarding my field to keep my self updated.</td>
<td>No Idea.</td>
<td>No Idea.</td>
<td>For preparing reports and for scheduling. It is also used for sending and receiving e-mails.</td>
<td>No idea.</td>
<td>No idea.</td>
<td>No idea.</td>
</tr>
<tr>
<td>Q. 22</td>
<td></td>
<td>Current infrastructure is not able to support the HIS implementation.</td>
<td>Current infrastructure is not meeting the requirements of implementation of HIS</td>
<td>Current infrastructure is not sufficient.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 4: Technology perspective
Technology plays an important role in any organization. Nowadays organizations are moving from traditional paper based system to computerized systems. As far as technology is concerned, from the collected data we found that CMH has no IT department. The management of CMH has signed a contract with a computer supplier. The supplier is providing them services which include upgrade of computer hardware, troubleshooting, monthly updates of software, update of antivirus and windows installation. Computers and internet facility are available in cardiology department but these computers are only used by the top management. Other than top management only the head nurse is provided with the internet and computer facility. The available computers are in good working conditions. In current system, the computers and internet in cardiology department of CMH are mainly used for sending and receiving e-mails, searching data over internet, for reporting and sometimes for scheduling. As there is no IT department in the CMH, the current infrastructure is not suitable to start the implementation of HIS.

4.2.4 Processes

We have asked 6 questions from participants during the interviews to collect data about the process factor. The empirical findings regarding this factor are presented in table 5.

The processes in cardiology department of CMH are conducted by coordination and interaction between the employees. Each process consisted of many steps, which are performed by many relevant employees to complete the process. All the tasks and processes are conducted by teamwork. To perform any process, information sharing between employees is required. In current system all processes are conducted in a manual way of information sharing like verbal and written instructions. Every employee uses this to transfer information regarding any process by sending and receiving the instructions and reports written on paper. The main problem which employees are facing during performing any task or during any process is only the inefficiency of system at the time when workload increases. As all the information sharing is done through paper and processes are dependent over information sharing so in manual system when workload increases, it creates problems in information sharing. Moreover, employees are also facing problems in maintaining patient records, and creating and maintaining inventories. The treatment to the patients requires various tasks like getting appointment with doctor, viewing patient record at the time of treatment, writing patient report, writing prescriptions etc. All these tasks require some information for completion and without efficient information exchange these tasks become slower to complete. It disturbs the proper coordination between employees and slow downs the overall processes. In current system, these problems occur only at the time when workload becomes high.
In present system the cardiology department keeps the patient record and maintains it in a traditional file system. It takes much time, as manual system is slower and all things are to be done on paper. The doctors and their assistants interact with each other to provide the patient care by many ways which include face to face interaction, intercom, and sometimes verbal or written instructions as mode of interaction to coordinate with each other. Face to face interaction and intercom are two common ways of communication between the employees of cardiology department.
<table>
<thead>
<tr>
<th>Participant / Question</th>
<th>P1</th>
<th>P2</th>
<th>P3</th>
<th>P4</th>
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<th>P6</th>
<th>P7</th>
<th>P8</th>
<th>P9</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Processes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Q. 23</strong></td>
<td>By coordination between all the relevant employees. Almost all the tasks and processes are conducted by proper team work.</td>
<td>Almost all the tasks and processes are conducted by team work by information sharing in the form of written and verbal instructions.</td>
<td>By coordination between all the relevant employees by exchanging written or verbal information in the form of instructions and reports.</td>
<td>By coordination between all the relevant employees. Almost all the tasks and processes are conducted by team work.</td>
<td>By coordination between all the relevant employees. Almost all the tasks and processes are conducted by team work.</td>
<td>By coordination between all the relevant employees. Almost all the tasks and processes are conducted by team work.</td>
<td>By coordination between all the relevant employees. Almost all the tasks and processes are conducted by team work.</td>
<td>By coordination between all the relevant employees. Almost all the tasks and processes are conducted by team work.</td>
<td></td>
</tr>
<tr>
<td><strong>Q. 24</strong></td>
<td>Due to workload, the processes become slower because of paper based information sharing culture.</td>
<td>Current working becomes slow because of manual system for information sharing to conduct various tasks because we are using manual system.</td>
<td>Paper based system is slow system and due to it sometimes increase in workload slow downs the whole processes.</td>
<td>Workload is unmanageable due to paper base system. Create difficulties in managing patient’s appointment timings and dates.</td>
<td>Due to workload, maintaining the patient records and dates become trouble because all work is done on paper.</td>
<td>No problems occur.</td>
<td>In manual system if a little error occur while reporting then whole report is to made again and it takes much time as we are working in manual system.</td>
<td>Sometimes workload increase creates problems in reporting and maintaining inventories.</td>
<td>Workload slowdowns all the processes as we are working in manual system.</td>
</tr>
<tr>
<td><strong>Q. 25</strong></td>
<td>N/A</td>
<td>Various steps are involved in treatment of patients. All steps involve proper communication between all the employees.</td>
<td>Patients are treated in very friendly, healthy and cooperative environment. Every possible step is taken to assure quality patient care. It is done by proper team work.</td>
<td>By proper team work. All the relevant employees communicate with each other to provide treatment to the patients.</td>
<td>According to the doctor’s prescription and by proper collaboration with doctor.</td>
<td>According to the doctor’s prescription and head nurse’s instructions. We treat patients by proper collaboration with doctor and head nurse.</td>
<td>According to the instructions given by the doctors.</td>
<td>According to the instructions given by the doctors.</td>
<td></td>
</tr>
<tr>
<td><strong>Q. 26</strong></td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
<td>Traditional file system.</td>
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</tr>
<tr>
<td><strong>Q. 27</strong></td>
<td>N/A</td>
<td>Face to face or by Intercom. Sometimes by verbal or written instructions.</td>
<td>Intercom, Face to face or by written instructions.</td>
<td>Some time instructions are given verbally or in written form. Common way is intercom and face to face interaction.</td>
<td>Face to Face and mostly through intercom.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Q. 28</strong></td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
<td>Intercom and face to face interaction.</td>
</tr>
</tbody>
</table>

Table 5: Processes Perspective
5. Analysis

Objective of this chapter is to present the analysis of the case study conducted in cardiology department of CMH to explore the problems that might become trouble for the implementation of HIS. Analysis for case study is presented with the help of socio-technical model that is explained in theoretical framework with four components. These components are structure, people, technology and processes.

The analysis is done with the help of socio-technical model defined by Watson (2007). The present working culture and condition of cardiology department is analyzed on the basis of the four perspectives of socio-technical model. These are structure, people, technology, and process.

5.1 Structure

Structure of organization is an important factor in IS implementation as Watson (2007) states that while introducing new system in organization it may fail because of the resistance of the intended users. In case of cardiology department of CMH, the entire system is paper based and organizational hierarchical structure is top down. In top down structure of any organization the resistance from lower management is always high. Top management of cardiology department has decided to implement new system without consulting lower management, who will be the intended users. It will be an entirely new system for the employees of cardiology department. Kotter (1996) states that change process is required to bring new system to replace current culture of organization. According to Sellitto and Carbone (2007, p. 41), “To facilitate the successful introduction of HIS, health care organizations need to consider and understand the importance that organizational change with need to be addressed as part of an implementation strategy”. Top management is sure that new system will be good but the employees from lower management of cardiology department have no experience of HIS thus they have no idea of new system. Despite the fact the top management has shown full willingness towards the adaption of new system after implementation of HIS but lower management is not ready to accept it at once. They have a few demands, like job security and time to adopt new system. Data collected regarding structure perspective shows that there will be resistance from the lower management which will be a big hurdle to overcome when starting the implementation process. They have doubts that after implementation they may lose their jobs as they do not have much knowledge about HIS. If cardiology department can get control over this problem then the implementation process will be less problematic to start.
Kotter (1996) has described that the resistance from lower management could be overcome by creating motivation and clear vision of new system. Before starting implementation process management needs to focus on selection of leadership, developing the vision and motivation.

Leadership is one of the important factors of bringing change in a system. Kotter (1996) explain leadership as a process of defining the vision, aligning people with the vision and inspiring them to make it happen despite the obstacles. Pagon et. al. (2008) has defined leader as the person who has to achieve change in an organization which would be accepted by employees and implemented in a way which result in general understanding and satisfaction of all. It is important for cardiology department of CMH to choose a leader who will be responsible for overcoming the resistance from employees and conducting the implementation process. Kotter (1996) states that managing change is important for transformation process to keep control on it. Sittig (2001) states that leadership is an important change management factor that needs to be considered in HIS implementation. By implementing HIS, cardiology department is transforming the current system to a new system so there must be a leader who can manage the change process. Kotter (1996) further explains that only leadership can motivate the actions needed to change behaviour in any significant way. As current hierarchal structure of cardiology department is top down, leader can play a vital role in overcoming the resistance of employees regarding implementation of HIS by developing vision.

According to Kotter (1996), vision refers to the picture of future. Leaders are responsible for developing the vision. With the help of vision they can clarify the future picture of organization to the employees to motivate them towards acceptance of the new state of organization. In cardiology department of CMH employees have no idea of HIS so a clear and effective vision is required for motivating them to accept the new system. For cardiology department of CMH a vision is required to explain the advantages of a new system by assuring employees that it will not affect their jobs and positions. It will also help in explaining that after implementation of HIS, in cardiology department it will enhance the functionality of administrative tasks and improve the quality of patient care by making the tasks of employees uncomplicated. Kotter (1996) has explained that a vision balances interests perfectly by promising to provide merely average benefits to employees. Vision is important for the motivation of the employees.

Watson (2007) has stated that there is need of motivation among the employees so that they should welcome the change in present system. Kotter (1996) has also explained motivation that it can be achieved by creating a clear vision regarding change and then communicating this vision among employees so that they can see the clear picture of future. Motivation could be obtained by involving lower management in decision making. In cardiology department of CMH, top management does not give any importance to the suggestions
provided by lower management. If top management will give importance to their suggestions, it will also motivate the employees at lower management to accept the new system. Employees of cardiology department have a fear of losing their jobs, so motivation can be created by assuring them that they will not lose their jobs. It is also required to make some announcements of increase in salaries for employees. Watson (2007) proposed a way of achieving motivation by announcing some current and future bonuses or reward systems in organizations to aid in employees looking favourable on the new system.

5.2 People

People factor is also important as far as implementation of HIS is concerned. Watson (2007) has described that the people component includes all the individuals who will be directly involved with the system. In the socio-technical model, the people perspective means that the employees must have enough skills, positive attitude and interest towards the upcoming system (Watson, 2007). In cardiology department of CMH the employees at top management have good know how of HIS but employees at lower management has no knowledge of HIS. According to the top management, all key employees will be the users of the new system. Key employees include head of department, doctors, their personal assistants, head nurse, other nurses, technicians, and administrative members. These employees have basic knowledge of computers but no idea of IT and its benefits regarding their field and they have no experience that how IT is being used in their field. So, according to current situation there will be problems in adoption of the new system for the employees of cardiology department because of lack of awareness of employees about IT and HIS. It can be a major hurdle in the way of implementation of HIS in cardiology department as Watson (2007) has explained that new system could fail if people are not regarded as important. It is very necessary that employees possess enough knowledge and skills regarding the new system so that they can easily understand and adopt it. According to Baus (2004), the knowledge and skills of employees of cardiology department regarding IT and HIS can be improved by training and awareness workshops.

Baus (2004) has stated that the system can not work properly until and unless awareness and training are provided to the employees who will use this system. Technical support and trainings are necessary for users so that they can feel comfortable using the system. As discussed above that employees of cardiology department of CMH do not have sufficient knowledge of HIS and IT so top management of cardiology department of CMH should arrange some seminars and workshops to provide awareness and training to their employees regarding HIS and the role of IT. Awareness includes information related to the working of HIS in other hospitals and its benefits. Employees have to be aware of the potential advantages of HIS that how it is helping the hospital employees to make their tasks simple and easy. It will bring interest in employees towards the new system. Training includes the education of employees regarding HIS.
For training purpose top management must hire some IT staff and arrange workshops so that employees can get some practical knowledge of HIS. The training phase actually starts when implementation will be done as Baus (2004) has explained that when implementation of new IS is completed then for potential success, proper training is required to reduce failure rate. Before implementation of HIS training of the key employees of cardiology department of CMH needs to improve their computer skills as they have basic computer skills but no experience of working in a computerized environment. Sobol et al. (1999) has stated that lack of computer skills is regarded as the most common barriers to HIS adoption.

5.3 Technology

Hersh (2002) explains that healthcare sites must have appropriate technology and infrastructure to start the HIS implementation process as the technology facilitates successful HIS implementation. In cardiology department of CMH there is no IT department and sufficient technology to start the HIS implementation process. Baus (2004) has stated that the lack of hardware and software in implementation of HIS is major hindrance. So it is clear that for starting the HIS implementation there should be sufficient IT infrastructure. Currently, in cardiology department, the IT infrastructure is not adequate. There are some computers and internet facility available in cardiology department but it is not enough to start the implementation process. There is a need of sufficient IT infrastructure which can support the implementation of HIS. IT infrastructure means LAN, Servers, Workstations, Internet, Network devices, and applications and databases. IT department is required to make this infrastructure and assure its security. All hardware and software related tasks for computing and network systems within cardiology department will be inventoried and sustained according to the IT department policies after establishment of IT department in CMH. All the acquisition related to hardware, software and communicating devices for the implementation of HIS will be done by IT department. IT department is the backbone for starting the implementation of HIS in any hospital.

5.4 Process

Watson (2007) has defined a process as a plan which includes all the steps that are taken to complete any of the tasks in an organization. The process factor is also very important factor of the socio-technical model. Watson (2007) has explained that it is necessary to align the process with other factors which are structure, people and technology. In cardiology department, the employees conduct all the processes by coordination and teamwork. The processes in cardiology department involve information sharing and all processes are conducted manually. It creates inefficiency as manual information sharing is a slow process. Inefficiency is the main problem which employees are facing during work. Employees of cardiology department are also facing the problem
in maintaining patient records, creating and maintaining inventories because of paper based system. These problems affect patient care as well as administrative processes. Top management of CMH had decided to implement HIS to overcome these issues. It will help employees of cardiology department in keeping computerized patient records, creating and maintaining inventories, and efficient information sharing processes. Top management of cardiology department should take care of aligning all the factors of information system as Watson (2007) explains that the four components of information systems are interdependent. It means that when change in structure, people and technology factors will be done, it will automatically change the process factor. During process designing, priorities of employees of cardiology department are to be given importance so that the process factor could be aligned with structure, people and technology factor. While designing processes, it will be better if Scandinavian approach for system designing could be used. This approach will help in involving the employees in designing and implementation process. According to Kyng (1994), the involvement of user in process designing is a Scandinavian approach and it provides better understanding and fruitful results.
6. Discussion

Objective of this chapter is to present the recommendations for cardiology department before starting implementation process according to structure, people, technology, and process perspectives of socio-technical model. These recommendations are made on the basis of theoretical framework and empirical findings for the targeted group. In this chapter recommendation regarding implementation approach is also suggested according to the present environment of CMH.

In this chapter we have suggested some recommendations after studying the current working environment of cardiology department of CMH. Previous studies mainly focused on the success and failure factors after the implementation of HIS. These studies have tried to explain that how to take control over these factors to reduce the failure rate. Literature regarding HIS implementation shows that overall failure rate is high as compared to success rate. It is because of improper planning of implementation process. There are only a few studies that show the general guidelines to properly plan the HIS implementation process. These guidelines could not be utilized for every case. For example, in developing countries, the scenarios for implementation process are different as compared to developed countries. The failure rate of HIS projects in developing countries is high in contrast with developed countries. The only reason highlighted by Malik and Khan (2009) is scarce literature about HIS implementation in developing countries. In developed countries, there are some examples to get understanding of HIS implementation. These examples can not be utilized for understanding the implementation process in developing countries because the circumstances and organizational culture are different in both.

This study provides better understanding of HIS implementation in CMH. As CMH is in developing country settings and practical examples showing successful implementation of HIS in such settings are rare to nonexistent. The only example in Pakistan regarding successful HIS implementation is Pakistan Institute of Medical Sciences (PIMS), Islamabad. They have successfully implemented HIS. Malik and Khan (2009) have conducted a study to identify the way, PIMS had successfully implemented HIS. They tried to identify the hurdles during implementation and how they were overcome. They have identified the success factors of HIS. Their study has improved the understandability of HIS implementation but still there was space left that how to plan the implementation process that can handle the problems that might occur before starting the implementation of HIS. In comparison to their work, this study not only improves the understandability of HIS implementation but this will also provide help to the management to make a plan for implementation of HIS. This study is conducted in cardiology department of CMH. It can be generalized to make plan for other departments of CMH. It will also provide help to the other CMHs situated in
31 cities of Pakistan as all CMHs have same working culture and environment. This study may not directly help other hospitals in creation of implementation plan because of difference in working environment but it will facilitate them to use it as literature to understand the HIS implementation process in developing countries.

We have studied the environment by considering four perspectives of socio-technical model in this research. On the basis of theoretical framework and empirical findings of this study we have suggested some recommendations which can be used to get help in making HIS implementation plan in developing country settings. If cardiology department consider these recommendations then the planning of implementation process will be effective and less problematic. This study also shows how socio-technical model has been used for providing recommendations for the construction of HIS implementation plan. We have tried to focus on the major factors which can affect the HIS implementation. These factors are the four main perspectives of socio-technical model. Empirical findings of this study are categorized in these four main perspectives. Moreover, we have also suggested recommendation for selection of implementation approach as it is considered an important factor for success of HIS implementation.

### 6.1 Recommendations regarding structure perspective

From the literature accessed for this study, it is found that when any organization decides to bring in a new system in its culture, the main hurdle they face is resistance from employees. In case of cardiology department, the resistance is shown by employees of lower management because they do not have sufficient knowledge about IT and HIS. Due to which they are worried that they may lose their jobs after implementation of HIS because they do not have practical experience of working in such environment where HIS is implemented. It requires change process for bringing new culture in any organization. Success of new system can be guaranteed if resistance from employees could be eliminated. In this regard the following recommendations need to be considered by cardiology department:

- **Select competent leader for conducting change**

  Select competent leader for conducting the change in current culture of cardiology department of CMH. While choosing the leader, main emphasis should be on the abilities and skills of the leader. Skills of a good leader include dedication, openness, creativity, fairness, assertiveness and leader must influence the employees.
• **Create a clear vision regarding new system**

A clear vision is required to provide future picture so that employees can see how new system will look like and work. Vision will show them the picture of upcoming system in which they will work. Vision will help to clear decks of expensive and time consuming clutter, to align individuals and to facilitate major changes by motivating actions.

• **Motivate the employees to accept new system.**

Motivate the employees to accept the upcoming system instead of showing resistance. Motivation can be built up by communicating a clear vision of new system among the employees. It can also be achieved by assuring them that they will not lose their jobs and by announcing some current and future bonuses.

6.2 **Recommendations regarding people perspective.**

During studying literature we come to know that skills of employees can be improved by training and awareness programs. Employees of cardiology department do not have enough knowledge and skills as far as IT and HIS are concerned. To improve the skills of employees regarding computer proficiency and HIS knowledge, following are some recommendations that need to be considered by cardiology department:

• **Arrange awareness programs for employees**

Awareness regarding IT and HIS should be assured by arranging awareness programs so that employees of cardiology department could get some knowhow of role of IT and HIS in health sector. The main aim of awareness programs will be making employees to come across the potential benefits and usefulness of HIS. They will become familiar with the role of IT and HIS in their field.

• **Arrange training workshops for employees**

Training of employees should be assured by arranging workshops to improve their computer and HIS proficiency. It will help employees to get some practical knowledge regarding HIS.
• **Hire competent computer and IS instructors**

   Competent computer and IS instructors should be hired for awareness, training and education of employees.

### 6.3 Recommendations regarding technology perspective.

Previous studies regarding HIS implementation shows that if there is lack of IT in any organization then implementation of information system will face hurdles and it may fail. Cardiology department do not have sufficient IT infrastructure to support HIS implementation. CMH needs to establish sufficient IT infrastructure so that they can start the implementation process of HIS. For establishing the IT infrastructure, CMH needs to consider following suggestions:

• **Establish an IT department in CMH**

CMH should establish an IT department. The structure of IT department is shown in section figure 6.

![Figure 6: Structure of IT Department for CMH](image)

The director of IT department will be responsible for hiring the IT staff which includes IT coordinator, academic coordinator, network administrator, application administrator, IT instructors, network specialist, application specialist and system technicians. This team will collectively work for establishment of IT department in CMH and educating the employees of cardiology department regarding computer and HIS applications.

• **Hire head of IT department**

   Identify and hire head of IT department. Head of IT department will be responsible for managing the technical and financial resources required to
develop and maintain IT infrastructure in CMH to meet the requirements so that implementation of HIS could be initialized.

- **Hire IT and academic coordinator**

Hiring of IT and academic coordinator should be done by coordination of top management of CMH and head of IT department. The responsibilities of IT coordinators will be the establishment and maintenance of IT infrastructure. The academic coordinator will be responsible for the awareness, training and education of employees of CMH regarding IT and HIS.

- **Hire IT staff**

Hiring of IT staff should be done by head of IT department, IT coordinator and academic coordinator. IT staff include network administrator, application administrator, network specialist, application specialist, system technician and IT instructors. The complete staff

- **Establish IT and telecommunications infrastructure in CMH**

IT department should establish IT and telecommunications infrastructure in CMH. This will require hardware and software acquisition, installation, repairing, monitoring, security, backups, and training services.

- **Select vendors for HIS designing**

IT department should select the best vendors for hospital information system designing. The vendors for hospital information system development should be selected by reviewing its track record. Selecting a vendor is a difficult process. Once a good vendor is selected, it will provide fruitful results during HIS implementation process and the final developed system will be effective.

### 6.4 Recommendations regarding process perspective.

The main problems faced by employees in current system are related to efficiency of system. Current system is paper based so, processes related to information sharing, creating and maintaining patient records, and inventories become time-consuming. Computerized system is a key to solve the faced problems. In this regard CMH has decided to implement HIS to bring efficiency in their system. When new system will be introduced then it will change all the processes. It means that the processes which are currently conducted manually, after implementation of HIS these processes will be done on computers. So these processes need to be re-designed. For re-designing the
processes, following recommendations should be considered by system designer:

- **Motivate employees to participate in process designing**
  
  Motivate the employees to participate in process designing as they will be the future users of the new system.

- **Ensure active involvement of employees in process designing**
  
  Active involvement of employees in process designing should be assured so that the way in which they are conducting various processes could be understood in better way.

- **Employees requirements should be considered**
  
  The processes should be re-designed according to employee’s requirements.

- **Employee’s satisfaction should be assured while designing process.**
  
  It means that if employees will not show satisfaction for new system then it may fail and all the effort towards HIS implementation becomes useless.

The above recommendations regarding process perspective are influenced by Scandinavian approach which assures that system design meets the employee’s requirements and is useable.

The four factors of the socio-technical model need to be interrelated to each other for implementation of new system. Above recommendations will help in inter-relating the factors. Now to start implementation there must be a method to be followed so that it can prevent system from failure. Three ways are discussed in theoretical framework. These are direct conversion, parallel implementation and hybrid implementation. The CMH has to plan the implementation of HIS in cardiology department so they are required to select the appropriate implementation method. In addition to above, it is suggested to consider the recommendation regarding selection of implementation process.

### 6.5 Recommendation regarding implementation approach

Recommendation that needs to be considered for the selection of implementation approach is:

- **Parallel implementation approach should be followed for implementation of HIS in cardiology department.**
  
  Parallel implementation approach is recommended because it offers to run parallel both the paper based system and new system for some period of time to reduce the system failure risk. If problems are experienced in new system, it
will be easy for the organization to move back to the old system, so that
problems in the new system could be resolved without disturbing the routine
working. If the new system meets the criteria, then organization will disable the
old system and use the new system for future. This process requires proper
planning and control.
7. Conclusion

Objective of this chapter is to answer the research questions that are set in the introduction chapter of this research. Later on this chapter will present the contribution to the academia and future research.

7.1 Answers to research questions.

The aims and objectives of this study, discussed in introduction chapter, explain that it is conducted to provide the better understanding of HIS implementation. It also aims to identify the problems and their solutions that might occur before the implementation of HIS. The main research questions for conducting this research were, “how can implementation of HIS be planned?” and “how the socio-technical framework can be used to aid in the construction of an implementation plan?” The CMH is planning to implement HIS but due to scarce examples regarding successful HIS implementation in developing countries, CMH is facing problems to construct a plan to start this process. To answer the main research questions we have conducted this research by considering the four perspectives of socio-technical model. These perspectives are structure, people, technology and process. The empirical findings regarding current working environment of CMH are analysed to provide the answer to main research questions. This study suggests following recommendations which will help CMH in construction of proper plan to start and conduct HIS implementation process in cardiology department. These recommendations are the answer to main research questions.

Regarding structure perspective the main problem that may come across the HIS implementation process is resistance from employees during the transformation of CMH, so to remove resistance following recommendations are suggested.

- Select competent leader for conducting change
- Create a clear vision regarding new system
- Motivate the employees to accept new system

As far as people perspective is concerned the problems which are explored, include lack of awareness, knowledge and skills of employees of CMH regarding IT and HIS. Due to these problems the HIS implementation could not be started or conducted in CMH. For handling these problems following recommendations are suggested.

- Arrange awareness programs for employees
- Arrange training workshops for employees
• Hire competent computer and IS instructors for training and education purposes

In CMH it is found that there is no IT department and sufficient IT infrastructure to support the HIS implementation process. In this regard following are the recommendations that needs to be considered so that CMH can start the implementation process.

• Establish an IT department in CMH
• Hire head of IT department
• Hire IT and academic coordinator
• Hire IT staff
• Establish IT and telecommunications infrastructure in CMH
• Select vendors for HIS designing

As current system of CMH is paper based and all processes are conducted manually. When HIS will be introduced then all processes need to be redesigned so for the redesigning of the processes following recommendations are suggested.

• Motivate employees to participate in process designing
• Ensure active involvement of employees in process designing
• Employee’s requirements should be considered
• Employee’s satisfaction should be assured while designing process.

During construction of proper plan for HIS implementation process in cardiology department, an appropriate implementation approach will be required. According to this case, the parallel implementation approach is recommended. These recommendations for planning HIS implementation in CMH (Cardiology Department) will help the top management to get better understanding of HIS implementation in developing country settings.

7.2 Academic Contribution

This study will benefit the target group that is management of all CMHs in Pakistan as CMHs are the main health care providers in the whole region. Managers of CMHs can use this study to understand the implementation of HIS and after reading the recommendations they can easily think about the factors which are to be considered while planning the implementation process. This study will also help other hospitals from the developing countries to use it as a source of literature to understand the HIS implementation process and the main problems that may occur before planning the HIS implementation. This study will also help the students who want to conduct research in IS implementation area. Students can gain useful information after reviewing theoretical framework which they can use in their research. In the next section, “Future Work”, we have clearly explained the research areas that could be interesting.
This study will help the students to understand the implementation of HIS so that they can easily carry out further research in this area. It will also guide the researchers who want to explore the problems and solutions in more depth before implementation of HIS in developing country settings.

7.3 Future Work

We found numerous research areas within IS field which could be attention-grabbing during working on this thesis. These research areas could be interesting for further research in this field to provide better understanding of HIS implementation in developing country settings. During the study we found that there are various issues between the top and lower management regarding IS implementation. The issues include power distribution among employees, lack of communication between top and lower management, job security and resistance from lower management etc. We have focused only on the resistance and ways to remove resistance regarding these issues. To understand these issues a research could be conducted by assuming that how to resolve issues between top management and staff regarding IS implementation. Management and project team can collectively play an important role to reduce the resistance from staff towards the acceptance of new system. It could also be an interesting area to conduct a study to find out that how management and project team can collaboratively work to reduce resistance from people while introducing new system in organization. In this study we have explained that users (people factor) can play important role in implementation of IS. An IS can become successful or it may fail if users do not take active part in it. So it will be interesting if a research could be conducted on the role of a user in transformation of any organization from paper based to computerized system. IS implementation process requires a huge amount of budget. It will be also an interesting area to conduct research for designing proper budgeting plan for IS implementation in any organization.
8. Reflections

When starting this thesis we were not completely aware of the wide range of the research subject and therefore not enough limitations were set. We have tried to make a deep study to understand the problems with the current system of CMH before implementing HIS but due to short time-frame we have been forced to limit the scope. We have tried to get the complete picture of the current system so that appropriate solutions could be suggested for explored problems regarding HIS implementation.

Socio-technical model has been used in this study for understanding the present system of CMH to explore the problems that might occur while initializing the implementation of HIS. After using this model we have explored different facts and information according to four factors which are structure, people, technology and processes. This model has helped us to understand the environment of CMH in efficient way. The empirical findings of this study are drawn by conducting online interviews with the key employees of cardiology department of CMH and by reviewing some of their routine process conducting documents. Socio-technical model has helped us in arranging the interview questions in four main categories. These categories were actually made on the basis of four perspectives of socio-technical model. It has helped us to collect relevant data from participants. We have learned that how empirical data could be collected in controlled and easily understandable way. The interviews for data gathering with the participant were conducted online via Skype which is entirely new experience for us. Though it was not easy task to collect data by arranging online interviews through Skype but with the positive and cooperative feedback of management of CMH we were able to collect data easily. We have made descriptions of gathered data and then finally we have presented main ideas of our gathered empirical data in the form of tables in this report which has helped us in managing the huge amount of data in very well manners. After collecting and analyzing data it is being revealed that there are some concealed problems that may become hurdles for starting a HIS implementation in cardiology department of CMH. On the basis of theoretical framework and analysed data we have highlighted some problems and suggested recommendations which will be helpful for CMH in making proper plan for the HIS implementation.

As discussed above that due to time limitation and narrow area of research, this study focuses only on the research questions, presented in introduction section. Still there are number of concerns which need to be explored in this area, like issues between top management and staff, role of users in transformation of hospital, developing budget for HIS implementation etc.

We are delighted with the results of this study and trust that the theories, empirical findings and the knowledge gathered during the Master’s study of IS degree, has helped us to manage and present the number of problems and recommendations that are essential to be considered for making a plan for HIS
implementation. After conducting this study now we can say that we have gained knowledge of how to conduct a research in effective and efficient way. We have learnt how to formulate a research design according to the research problem. In this study we have used different tools and techniques for empirical data gathering, formulating results and analysis. The main thing which we have learnt during this thesis is formulation of theoretical framework. We become aware of theoretical framework that it is necessary and important thing in the field of research. This study has improved our knowledge and skills so that we can take apart in research to contribute in the field of Information Systems.
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Appendices

Appendix A: Interview questions.

General Questions

- What is your name?
- What is your role and responsibilities in cardiology department?
- How much is your total working experience?
- How much is your working experience at cardiology department of CMH?

Structure Perspective

1. What is current working environment of Cardiology department of CMH?
2. What is current hierarchal structure of organization?
3. What hierarchy currently exists for main flow of information?
4. Who are the main people involved in decision making?
5. Is lower management involved in decision making regarding any innovation?
6. As top management has decided to implement HIS, whether they asked lower management for suggestions regarding implementation of HIS?
7. What happens, if lower management gives any suggestion? Is it given any importance or not?
8. Are you satisfied with current working system?
9. What are deficiencies of current system?
10. What are the main aims to introduce hospital information system in Cardiology department?
11. What do you think could HIS improve current working system?
12. Are employees/you willing to adopt/accept new system?

People Perspective

13. What are the skills and qualifications of employees who will use this system?
14. What computer skills, employees/you possess?
15. Are employees/you provided with computers and internet for their tasks?
16. What is your/employees knowledge regarding IT, and HIS?
17. Who will be the users of HIS after implementation?
Technology Perspective

18. Is there any IT department in CMH?
19. Are computers available in cardiology department?
20. Is internet facility available in cardiology department?
21. What are the main purposes of available computers and internet?
22. What do you think about infrastructure of cardiology department, will it meet the requirements to implement HIS?

Process Perspective

23. How different processes are conducted in accomplishment of various tasks?
24. What are the main problems, which appears while working?
25. How patients are treated?
26. How patient records are maintained?
27. How doctors and their assistants interact to each other for providing patient care?
28. How other employees interact with each other during any task?
Appendix B: Secondary data source.

Diagnosis form.
Medical case sheet

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**Date and Time**: Condition on Admission and Progress of Case.
(Incl complaints, Present, past, family and personal hist, clinical exam investigation and their results and the treatment prescribed. Progress report will be written as often as is need.)

**CONF**
Medical history sheet.

**Patient's Profile**

- **Name:**
- **Age:**

- **Gender:** M/F
- **Marital Status:**
- **Address/Unit:**

- **Date of Admission:**
- **Mode of Admission:**

**Presenting Complaints**

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**History of Present Illness**

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**Past History:**

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**Personal History:**

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**Family History:**

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**Drug/Allergy History:**

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**Socioeconomic History:**

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**Gynaec/Obstetric History:**

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Clinical chart

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| Pulse per minute |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| Blood pressure |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

| Admission Date |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

Signature

Incharge of case

Treatment chart

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<tr>
<th>Patient Name</th>
<th>Disease</th>
<th>Date of Admission</th>
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<tr>
<th>Date</th>
<th>Name of Medicine</th>
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<th>Timings</th>
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Dr Signature
Hospital discharge slip

HOSPITAL DISCHARGE SLIP
AK CMH MUZAFFARABAD

TO

CO_________________________
(Patient’s Name)

No._____ Rank_______ Name__________________________
of your unit was admitted in CMH_____________________
on_________________ and was disch on_________________
Disease while in hosp was___________________________

Which was/was not beyond his/her con.

Sick Leave

Date________________ Signature________________________
Strike out whichever MO IC Case
not Applicable Rank & Appt.____________________________

COUNTERSIGNED

DATE__________ 2010

OC
Hosp
Request for laboratory examination

1. Nature of Specimen
2. Time Collected
3. Exam req.
4. No, Rank & Name
5. Age
6. Unit
7. Ward/Date
8. Date of Admission
9. Date of onset
10. Disease
11. Brief Clinical notes

MO is Case.