STUDY OF QUALITY IMPROVEMENT SYSTEM
(A case study of National Medical College, Teaching Hospital Birgunj)

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RECOMMENDATION

This is to certify that the thesis

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Entitled:

STUDY OF QUALITY IMPROVEMENT SYSTEM
(A case study of National Medical College, Teaching Hospital Birgunj)

has been prepared as approved by this Department in the prescribed format of the Faculty of Management. This thesis is forwarded for examination.

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VIVA-VOCE SHEET

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And found the thesis to be the original work of the student and written according to the prescribed format. We recommend the thesis to be accepted as partial fulfillment of the requirement for the degree of ***Master of Business Studies (MBS)***

Viva-Voce Committee

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DECLARATION

I hereby declare that the work reported in this thesis entitled " Study Of Quality Improvement System (A Case Study Of National Medical College, Teaching Hospital Birgunj) submitted to Office of the Dean, Faculty of Management, Tribhuvan University, is my original work done in the form of partial fulfillment of the requirement for the degree of Master of Business Studies (MBS) under the supervision of **Prof. Dr. Kamal Das Manandhar** of Shanker Dev Campus, T.U.

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I select this research on behalf of NMC, which provide a lot of service in health sector regarding I just completed my research on behalf of Quality Improvement System. When I was in this research writing process which makes me personal beneficial to my work plan.

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ABBREVIATIONS

BSP	:	Business System Planning
CEO	:	Chief Executive Officer
CIO	:	Chief Information Officer
CM	:	Configuration Management
CMM	:	Capability Maturity Model
CMMI	:	Capability Maturity Model Integration
CORE	:	a requirements tool marketed by Vetch Corporation
CQI	:	Continuous Quality Improvement
CSF	:	Critical Success Factor
CT	:	Cycle Time
DOORS	:	Dynamic Object-Oriented Requirements System, a requirements tool marketed by Teleology Corporation
ICT	:	Information Communication Technology
IS	:	Information System
ISO	:	International Standards Organization
IT	:	Information Technology
LCL	:	Lower Control Limit
MD	:	Managing Director
MIS	:	Management Information System
NMC	:	National Medical College
OEC	:	Organization Effective Cycle
PDCA	:	Plan-Do-Check-Act cycle (also known as Deming Cycle or Shewhart Cycle)
PI	:	Process Improvement
PM	:	Project Manager
QA	:	Quality Assurance
QI	:	Quality Improvement
QIT	:	Quality Improvement Team
QMB	:	Quality Management Board
RA	:	Requirement Analyst
RTM	:	a requirements tool marketed by Integrated Chipware
TQI	:	Total Quality Improvement
TQM	:	Total Quality Management
UCL	:	Upper Control Limit

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CHAPTER-I

INTRODUCTION

1.3 Background of the Study

MIS can be defined as "A systematic or organized way of providing informational support to the managerial functions of an organization."

It is a system to convert raw data from internal and external sources into information to communicate that information in an appropriate form to managers at all levels, to enable them to make timely, effective decisions for planning, directing and controlling the activities for which they are responsible.

It is integrated of three components i.e. management, information and system. It is a group of people, a set of element which stores, selects, process and retrieves data to reduce the uncertainty in decision making process by producing necessary information for managers at the time they can most efficiently use it.

It is a necessity of all the organization. The concept of the MIS has evolved over a period of time comprising many different facets of the organization functions. It is an evolutionary process than a dramatic overnight change. The evolution started form early 1950's with data processing system. MIS is evolved as the managers wished to use computers for planning, controlling and decision-making.

In early business organizations, the manager is a generalist, having knowledge about all the activities of the firm. As the size and scope of the business firm increased, general knowledge gave way to specialization. Soon, large organizations became accumulate of specialists, each knowing more about a particular field then any generalist. However, these generalists did not work together, thus resulting to problems like lack of communication, lack of co-operation and reduction in the effectiveness in the performance.

Thus, this is where the computers came in to support all the resources of the entire organization. Resources not only include the human, material, or financial resources but also information. Information is especially valuable because it represents the other tangible resources.

With computerized MIS, the various data and information systems of the firm are integrated and data and information flow from one area to another. Today, managers make business decisions, access situations, take risks, weigh subjective factors and think creatively. In addition to this, the modern manager must be able to see the firm as an integrated system of resources working towards a primary goal.

The purpose of MIS is to rise managing from spotty information, institutive guess work, to system information, sophisticated data processing and system problem solving.

In healthcare organization, every activity is to be adapted to a customer-inspired quality improvement approach. Using this approach, it made IT teams more effective, more focused, and more result oriented.

To evaluate improvement, customers and their expectations should be identified; key processes should be defined, effective process improvement team should be set up, and quantifiable measures should be established. This project focuses on prevention by rethinking process activities to eliminate the real sources of problems and customer dissatisfaction.

The first step-and often the most difficult-is to identify and define key processes according to customer perceptions, not what management thinks is important to customers. A decision in one department may create more steps in the process than in another department or it may change things so that another group is no longer in compliance with standards they need to maintain. It may be a quality improvement for us, but it plays havoc in other parts of the organization. Unlike many other healthcare organizations which often focus their quality improvement programs on patients, the needs of all customers inside and outside the organization should be considered.

Continuous process improvement is slow and painstaking work and that can be difficult for healthcare people who are accustomed to instant gratification in taking care of patients. It's hard to see the reward while we are building a solid process for identifying issues, gathering and analyzing data. But the results are worth waiting for, and when we start to make significant achievements the staff gets excited and wants to be included and involved. Process improvement is always a work in progress because the standards keep getting higher. It is long term commitment to quality.

1.4 National Medical College, Teaching Hospital

1.4.1 Overview

NMC is affiliated with internationally renowned Tribhuvan University, Kathmandu, Nepal, the degree of which is recognized by the Medical Council of Nepal, India, Pakistan, Bangladesh, Sir Lanka and General Medical Council of Great Britain. The college is also recognized by the Medical Council of Nepal and is approved by the Ministry of Education and Sports, HMG/Nepal.

National Medical College is leading Medical College in Nepal established with a vision of providing the best education and service supported by high standard infrastructure. NMC is located in south of Nepal in a city called Birgunj.

Like other medical colleges NMC has two wings:

a) College Wing

College Wing of NMC is powered by over two hundred students supported by qualified teachers under various departments. The college has future plans of expanding the education facility to the students.

b) Hospital Wing

Hospital Wing of NMC has both Inpatient as well as Outpatient departments. NMC has about 400 beds in the inpatient under various Departments. On an average the flow of the outpatient in the hospital is 700 patients per day on various investigations and procedures. Similarly on an average there are 100 inpatients per day in the hospital in various wards for various investigations.

NMC is a medical College with tremendous potential with great vision for future, thus they have decided to computerize the entire system for more efficient working environment.

National Medical College has a good position among other medical College in the country. The inflow of patients as well as expansion of college wings is greatly increased from past few years. The traditional information system is not able to meet the total demand of daily operation, and standards in the hospital. NMC has to strengthen its computer based management information system to enhance its efficiency, quality and competitive ability which enable to face with the problem and challenges more strongly in the future. However, the management information system is one of the most reliable sources of action; information system based Quality Improved System is required.

1.4.2 Mission Statement

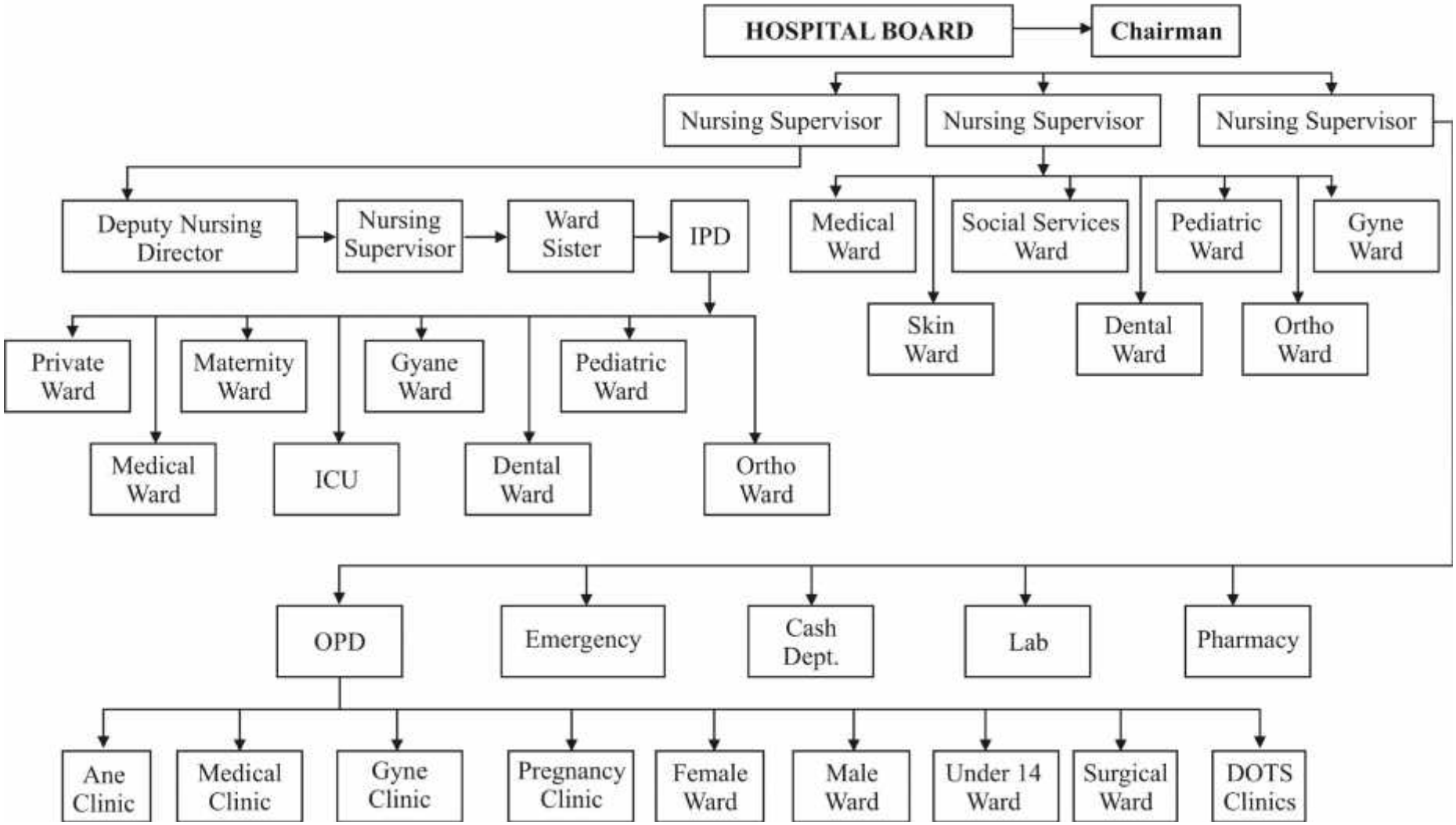
National Medical College, established in dedication to the people of Nepal, is onsecrated as a holy center of learning in Health Science for sons and daughters of the "Global Village" in general and for the sons and daughters of Nepal in particular, aims to impart Health Science Education, perform Scientific Research and provide quality Health Services. It aims to enables its students to acquire skills required for performing duties of a competent Medical Graduate and to make them benevolent, compassionate and sympathetic, the Messiah of the present century.

1.2.3. Organizational Structure

NMC, Teaching Hospital, Birgunj has been managed by a board of directors. Board of director formulates polices to achieve the set of goals and to comply with the guidelines outlined by the Tribhuvan University.

Table:

Fig 1: Organizational Structure of National Medical College, Teaching Hospital



1.3. Focus of the Study

This research study conducted in NMC, Teaching Hospital mainly focused in MIS department with reference to information system and its quality improvement. The study concern about the nature of information requirement at different levels of management and nature of decision they made. The study mainly focused on the identifying the key processes and selecting the major key process to improve which is flow of patient records beginning from registration to discharge of the patient.

1.4. Statement of the Problem

In most of the Healthcare organization, the foremost process is patient registration and last most process is patient discharge and payment policies or payment claim rejection. Since the prior information of the patient is entered during the patient registration process, it is the key process of the Hospital. In hindsight, the registration process is an obvious starting point in the improvement effort. NMC, Teaching Hospital provides its patients with identification cards displaying the information in creative, non-standardized formats.

Given with the wide variety of identification card formats, it is difficult for the person registering the patient to obtain the proper information. Therefore, the hospital has come to routinely expect registration errors.

The new computer system, however, does not generate reports regarding the clearing-house's discharge claim rejection rate. Thus, the Management has to estimate the current rejection rate by manually tallying several weeks' worth of claims. That exercise indicated that the clearinghouse rejection rate is greater than the previous system. Assuming the rejection rate of the tallied claims is generally accurate for all claims submitted for payment, it meant the hospital is experiencing a fivefold increase in claim rejections compared to the pre-upgrade stage.

The lack of continuously monitoring process to verify that each process beginning from patient registration to discharge, it is difficult to measure the quality improvement. To distinguish special cause variation from common cause variation, the computer runs are too sporadic, and the necessary computer-generated data are not

routinely available (Sometimes certain key programs aren't run for a week or more because of the computer's slow processor speed and lack of disk space.). Rather than manually gathering the data, the output reports of computer with occasional manual calculations, before each meeting, is reflected only the output errors related to the payment rejections received since the last meeting.

Since computer operators might enter patient information at any one of more than 10 different terminals, the Management collects the payment rejections on a "by reason by location" basis. Location information is tracked only at the branch level because the computer software isn't capable to tracking data entry information by user identification or terminal identification. A check sheet is manually constructed and completed to summarize each week's claim rejections. (Computer-generated reports showing such information are not readily available.)

1.5 Objectives of the Study

The general objective of this study is to apply theoretical knowledge of Management Information System provided in the class in analyzing and developing of an information system for the Quality Improvement System of National Medical College, Teaching Hospital, Birgunj, Nepal.
The main Objective of the Projects:

- To identify the Key Work Processes
- To select the key process to improve
- To analyze and make MIS based Quality Improvement System for Patient's Record Flow System.

1.6. Significance of the Study

In the service oriented organizations, very big congregation of people gathers to entertain the service. It reveals that people have expectation on higher quality form hospitals than form small clinics or private consultations or private doctors. So the

quality improvement system is one of the most important factors of service oriented organization. It is an effective tool (way) to attract new experts, doctors and patients.

Having lack of adequate knowledge of Quality Control Systems, the people are haphazardly running the hospitals. It shows that there is an extreme necessity to establish clear conception about the Quality Improvement Systems that yields quality service.

In the present context, we find that there exist almost none of the companies adopting Quality Improvement Systems. There may be many reasons behind it. But there is not sufficient study conducted in this regard. Therefore, considering all these facts, the study is undertaken which will help to meet deficiency of the literature relation to Quality Improvement System and factors affecting the service oriented industry like hospitals. So the study of Quality Improvement is of considerable importance.

Many policy making bodies who are concerned with Management Information System and Quality Improvement System will be benefited from this study. It will also provide valuable inputs for future research scholars as well.

1.7 Limitations of the Study

This study is a simple research which has to be conducted and submitted within the prescribed time. This research is about the **Quality Improvement System** of NMC, Teaching Hospital. There are some limitations of this study, which are mentioned below:

- The study mainly concentrates on available information provided by the staffs of NMC, Teaching Hospital;
- This study in some case suffers from lack of relevant data;
- Some of the required data required for the chart analysis are assumed by visual inspection and observation of the NMC, Teaching Hospital;
- The degree of truth is fully dependent upon the information provided by the concerned authorities of NMC, Teaching Hospital.

1.8 Organization of the Study

For this study, a significant study has been conducted for deep understanding of how MIS involved and for what and how it is used which is discussed in the Reviews of Literature section.

A hospital information system is analyzed using a process flow model and process flow charts (DFD and ER Diagrams) by primary and secondary data collections. Then the following steps are conducted to identify and execute the steps:

a) Determining the existing Work Processes(current performance)
b) Identifying the Key Work Processes
c) Selecting a need(Key Process) to improve
d) Obtaining Commitment and Assigning Ownership
e) Creating Customer-Supplier Relationship
f) Identifying What to Improve
g) Developing a Review Process
h) Defining Initiation of Test Solutions (quality improvement process) that will accomplish the Improvement Objective
i) Producing Improvement Plans which specify how and by whom the changes will be implemented
j) Identifying and Overcoming any Resistance to the Change
k) Putting in place controls to hold new levels of performance and repeat from step first.

During these procedures, statistical tools are used to measure the quality. And finally the review process is designed. However, the final phase is the implementation of the system to achieve its goal.

CHAPTER-II

REVIEW OF LITERATURE

2. Conceptual Framework

2.1 Evolution of Management Information Systems

In the past decades, the potential of information systems to support organizational activities and to attain competitive advantage has been widely recognized by academic literature as well as the business community. MIS planning methods have been constructed in an attempt to use is successfully in organizations.

However, these planning methods have been found to be theoretically unsound and their practical usefulness has no empirical support. A study of the evolution of an MIS strategy is informed by concepts that have been found promising in the area of organizational evolution. It suggests that the idea of co-evolution of MIS with its organization is especially interesting.

Recognizing the potential of MIS is one thing, how to use MIS strategically in organizations to attain competitive advantage is another. Strategic MIS planning might give the possibility to visualize the potential contribution of information systems to the give the possibility to visualize the potential contribution of information systems to the organization. Especially in the eighties, the general agreement seemed to be that an MIS strategy should be derived from the business strategy. The search for this link between business and MIS strategy has led to the construction of MIS planning models for integrating these two areas of strategy. Planning models are useful when programming already created strategies, not for the creation of strategies. MIS planning models, initially created to develop the IS function in organization, may have lost their practical use. Moreover, research in organizations where the use of MIS has resulted in a competitive edge has indicated that the practical use of MIS planning methods is minimal. The lack of empirical research and the idea that planning methods fail to implement MIS strategically in organizations suggest that more investigation is needed within the business area.

More recently, incremental and evolutionary approaches towards the use of MIS in organizations have received some attention. Theses approaches have points of contact with classical findings in the formulation of organizational strategies. By conducting interviews, examining organizational documents related to MIS strategy and witnessing the development of MIS in practice, a longitudinal field research approach is taken to investigate the evolution of the MIS strategy. This approach is a through study of linkages between changes in business environment, business strategy and the IS strategy.

2.2 Management Information System

A management information system (MIS) is a system or process that provides the information necessary to manage an organization effectively. MIS and the information it generates are generally considered essential components of prudent and reasonable business decisions.

The importance of maintaining a consistent approach to the development, use, and review of MIS systems within the institution must be an ongoing concern of management. MIS should have a clearly defined framework of guidelines, policies or practices, standards, and procedures for the organization. Theses should be followed throughout the institution in the development, maintenance, and use of all MIS.

MIS is viewed and used at many levels by management. It should be supportive of the institution's longer term strategic goals and objectives. To the other extreme it is also those everyday operating systems that are used to ensure basic control is maintained over record keeping activities.

An institution's MIS should be designed to achieve the following goals:

- Enhance communication among employees.
- Deliver complex material throughout the institution.
- Provide an objective system for recording and aggregating information.

2.3 Information Systems in Organizations

The past decades witness a shift from focusing on the pure administrative role of MIS in organizations, via an operations role, to a more competitive role. The administrative roe relates to the automation of specific administrative functions and the aim is to enhance efficiency. The operations role is an extension of the administrative role and focuses on the capability to automate the entire set of business processes as opposed to only administrative activities. Especially during the 1980's, academics and the business community recognized the potential of MIS to effect the competitive capability of the organization. This competitive role focuses on MIS as a source of competitive advantage.

2.4 The General Management System

The functions of management are not performed sequentially. Planning is involved in organizing and controlling. Similarly, organizing is required for planning and controlling. Each function interacts with the others to form the management process. The general model of managing as shown in ***Figure 2.1*** and can be described as follows:

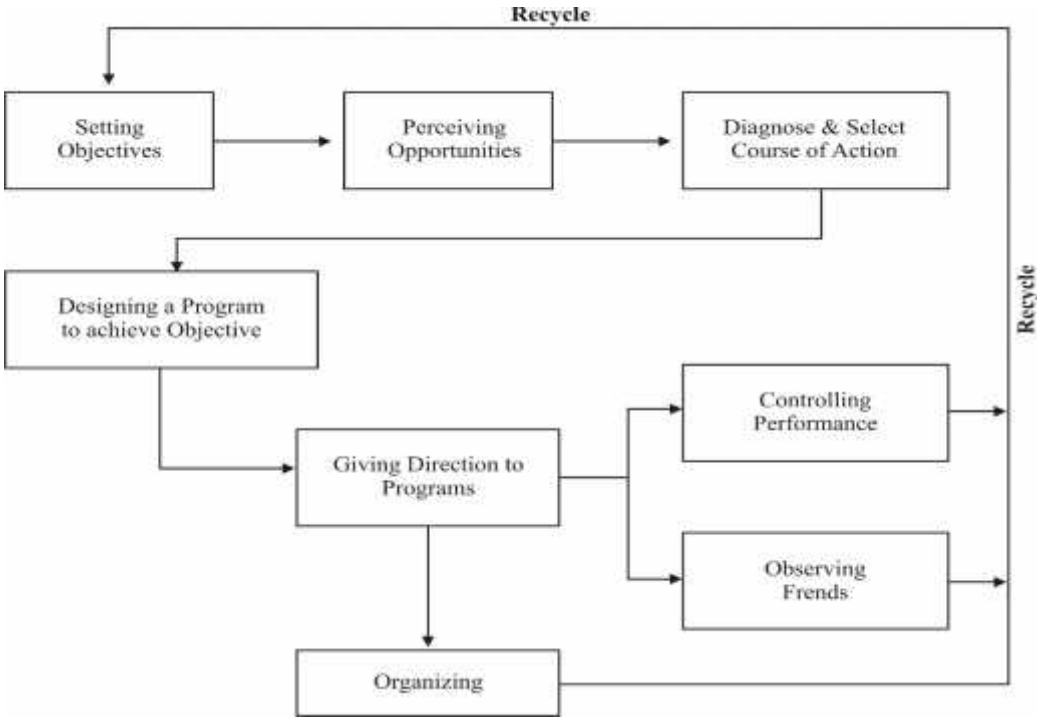


Fig 2.1: Concept of Management

Planning

a) Setting of objectives for the manager's area of activity.

b) Perception of opportunities, problems, and alternatives surrounding the achievement of the objective.

c) Diagnosis of opportunities, analysis of objectives, and selection of a course of action.

d) Design of a program of action to achieve the objective.

Directing

Leadership in the necessary organizational action required to achieve the program, including communication and motivation of subordinates.

Organizing

Supervision of the action plan through an organization whose task relationships are defined and understood.

Controlling

a) Observation and measurement of performance against standards for achieving the plan and correction of performance deviations if required.

b) Observation of significant trends within and without the manager's activity so that goals and programs may be modified as necessary.

Feed Back

Recycling of information concerning plans, actions, and progress at different stages of the management process to insure that proper programming to achieve the objective is being accomplished.

Thus, the management process is iterative. Many organizations and managers make the basic mistake of believing that a management information system can be

designed or made operational without the backup of an adequate management system. An adequate management system includes organizational arrangements, structure and procedures for adequate planning and control, clear establishment of objectives, and all the other manifestations of good organization and management. Given this management structure, this framework of good management practices, an information system can be designed upon its foundation. Only then can the information system provide the manager w2ith the information needed in the form, place, and time to perform the job according to the specifications of the management system.

The purpose of the management system is to develop plans for achieving objectives, to organize for implementing plans, and to control performance so that plans and actions occur on schedule. The place of information in performing these three basic processes is shown in ***figure 2.1.*** The step, recognition of a problem or an opportunity, is usually prompted by information from the control process concern ing a deviation from standard or by search and evaluation of those systems (environmental, competitive, internal) affecting the planning process. Definition of the problem, determination and evaluation of alternative courses of action, and selection of a course of action are fundamentally steps in the planning and decision-making process. Information needs for this process are those indicated in ***figure 2.1.*** Finally, once a decision is made or a plan developed, it is necessary to implement and control the solution. Implementation becomes a matter of organizing the necessary resources and directing them in the performance of the plan. Control involves the measurement of performance and correction of deviations. The process starts over again either by recognition of the need for planning or by the appearance of a new problem arising from the control process.

In the remainder of this section, three aspects of the major managerial functions of planning, organizing, and controlling are examined. First, a definition and description of the process is advanced so that the reader will have an understanding of how it is performed. Second, "how does the systems approach to the managerial function differ from the more traditional approach?" is analyzed. Finally, because management is the real reason for having information system, the stage for MIS by describing how planning, organizing, and controlling are facilitated by the storage and retrieval of information.

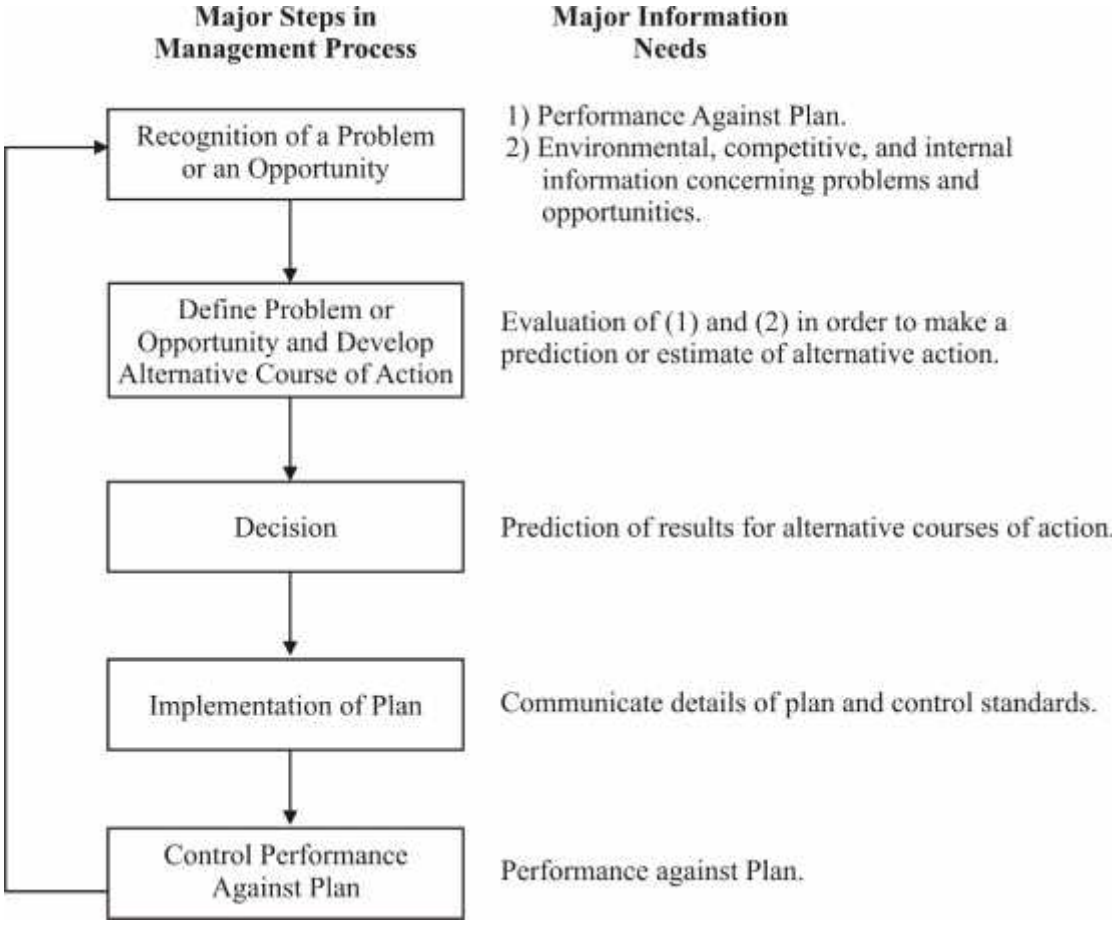


Fig 2.2: The Management Process and Information Needs

2.5 The Role of Management Information System

The role of MIS in an organization can be compared to the role of the heart in the body. The information is the blood and MIS is the heart. In the body, the heart plays the role of supplying pure blood to all the elements of the body including the brain. The heart works faster and supplied more blood when needed. It fulfills the needs of blood supply to human body in normal course and also in crisis.

MIS plays exactly the same role in the organization. The system ensures that an appropriate data is collected form various sources, processed and sent further to all the needy destinations. The system is expected to fulfill the information needs of an individual, group of individuals, managers etc. MIS satisfies diverse needs through a variety of systems such as query systems, analysis systems, modeling systems decision support systems. MIS also helps in strategic planning management control,

operational control and transaction processing. MIS helps junior management by providing operational data for planning, scheduling, controlling and also helps them further in decision making at the operational level to correct an out of control situation. MIS helps middle management in short term planning, target setting and controlling the business functions.

MIS also helps top management in goal setting, strategic planning and also evolving the business plans in addition to their implementation. MIS in fact plays the role of information generation, communication, problem identification and helps in the process of decision making. Thus MIS plays a vital role in management, administration and operations of an organization.

Role of MIS in Organizational Effective Cycle

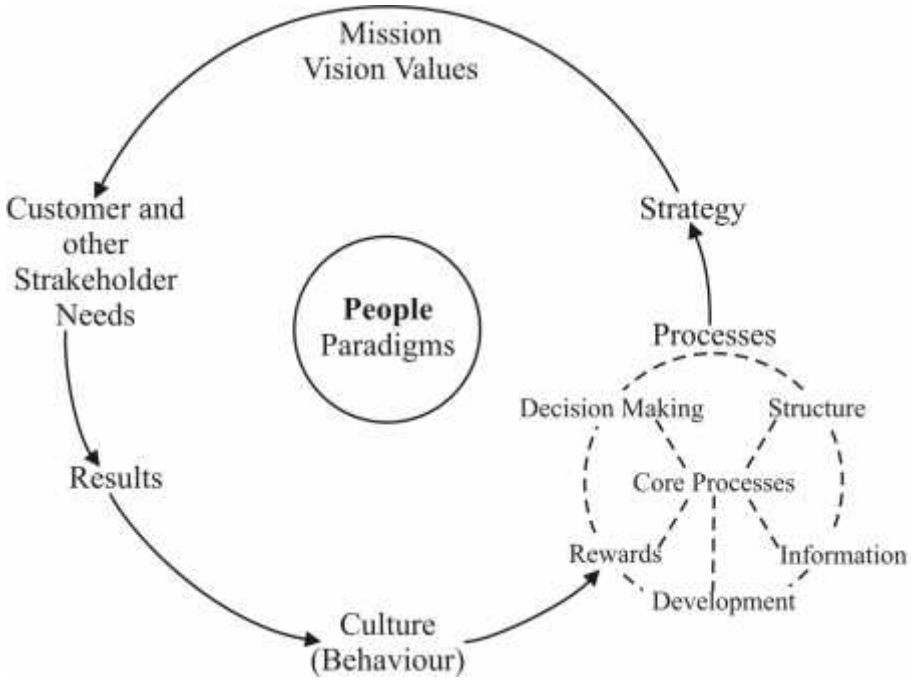


Fig 2.3: Organizational Effective Cycle (OE Cycle)

The role of information can be depicted in the OE cycle as shown in the ***figure 2.3.*** So, the information is needed for the every process that occurs in the organization. And every process that leads to the strategy of the organization.

2.6 Quality

In its broadest sense, quality is a degree of excellence: the extent to which something is fit for its purpose. In the narrow sense, product or service quality is defined as conformance with requirement, freedom from defects or contamination, or simply a degree of customer satisfaction. In quality management, quality is defined as the totality of characteristics of a product or service that bears on its ability to satisfy stated and implied needs. Quality is also rapidly embracing the nature or degree of impact an organization has on its stakeholders, environment and society.

2.7 Methods of Quality Management

Several methods have evolved to achieve, sustain and improve quality. They are known as quality control, quality improvement and quality assurance-collectively known as quality management. Quality management is not the preserve of one manager but of all managers. Quality is achieved thro0ugh a chain of processes, each of which has to be under control and subject to continual improvement. The chain starts with top management expressing a firm commitment to quality, them:

- Establishing customer needs and expectations.
- Developing and maintaining a management system that will enable achievement of customer needs and expectations-reliably, repeatedly and economically.
- Designing products and services with features which reflect customer needs.
- Building products and services so as to reproduce faithfully the design.
- Verifying before delivery that products and services possess the features required.
- Preventing the supply of products and services which possess features which dissatisfy customers.
- Discovering and eliminating undesirable features in products and services.

- Finding less expensive solutions to customer needs.
- Making operations more efficient and effective.
- Discovering what will delight customers and providing it.
- Most importantly, honoring commitments.

A variety of standards, philosophies, methodologies, tools, techniques and measures have been developed to help organizations meet these goals:

- Management systems-ISO 9000, ISO 14000, BS 88000, BS 7799.
- Philosophies-business process management, continual improvement.
- Tools and techniques-process charts, failure mode and effects analysis, statistical process control, quality function development.
- Measure-quality awards, best value, ISO 9000 and Investors in People.

2.8 An Integrated Quality Approach

Many "quality approaches" have been put forward over the years, such as Total Quality Management (TQM), the Malcolm Baldrige Award Criteria, Six Sigma, Quality Is Free, Zero Defects, the Balanced Scorecard, standards developed by the International Standards Organization (ISO), and others. One of the problems in deploying quality programs has been convincing management and the organization that they are worthwhile.

Another problem is that, often, quality initiatives are difficult to sustain. Quality in an organization or on a project is more a way of life than a separate program, and the choice of the quality model to be used is less important than focusing on meeting customers' real needs. Quality is the way we work, not a separate function. This is important to the requirement analyst (RA) because there is a direct connection between meeting customers' real requirements and a quality approach. There is a set of business drivers (high-level customer needs and expectations) that are really high-level customer requirements, which RAs must address. Management has a critical role relative to quality. If management does not value quality, quality

won't happen. There is a set of principles in any organization that serves to provide guiding values for the work that is performed in the organization. This requires a set of quality improvement techniques. Individuals are responsible for the quality of their products and services.

Following sections explains an integrated quality approach that facilitates and supports the work of the RA. It will show that an effective requirements process is necessary in order to have an integrated quality approach and that an integrated quality approach is required for the process to work best. By an integrated quality approach, the use of quality improvement techniques are incorporated into the daily work performed on a project and in an organization with the goal of achieving customer satisfaction.

This is easier when there is a supporting infrastructure and an expectation of management (throught its stated values and principles) that supports the work of the anlysist. A caustion is that no matter how committed people or teams are to quality and to the effective use of quality improvement techniques, they may not be successful if other teams, members of their own team, and management do not share that commitment.

2.9 The Components of an Integrated Quality Approach

The components of an integrated quality approach may be described as management, customers, projects and tasks, OI teams, and QA. ***Figure 2.5*** describes how these components work together.

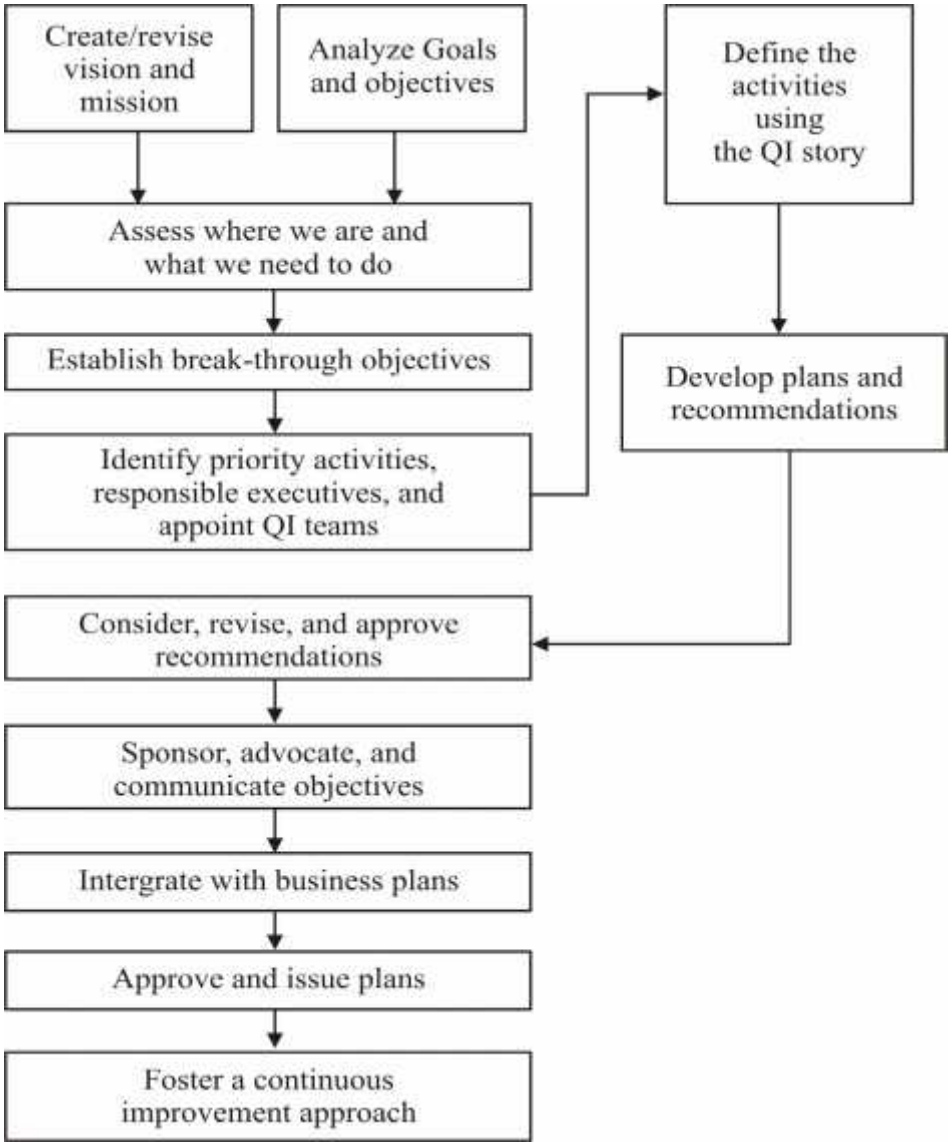


Figure 2.4: Deciding what we want to achieve

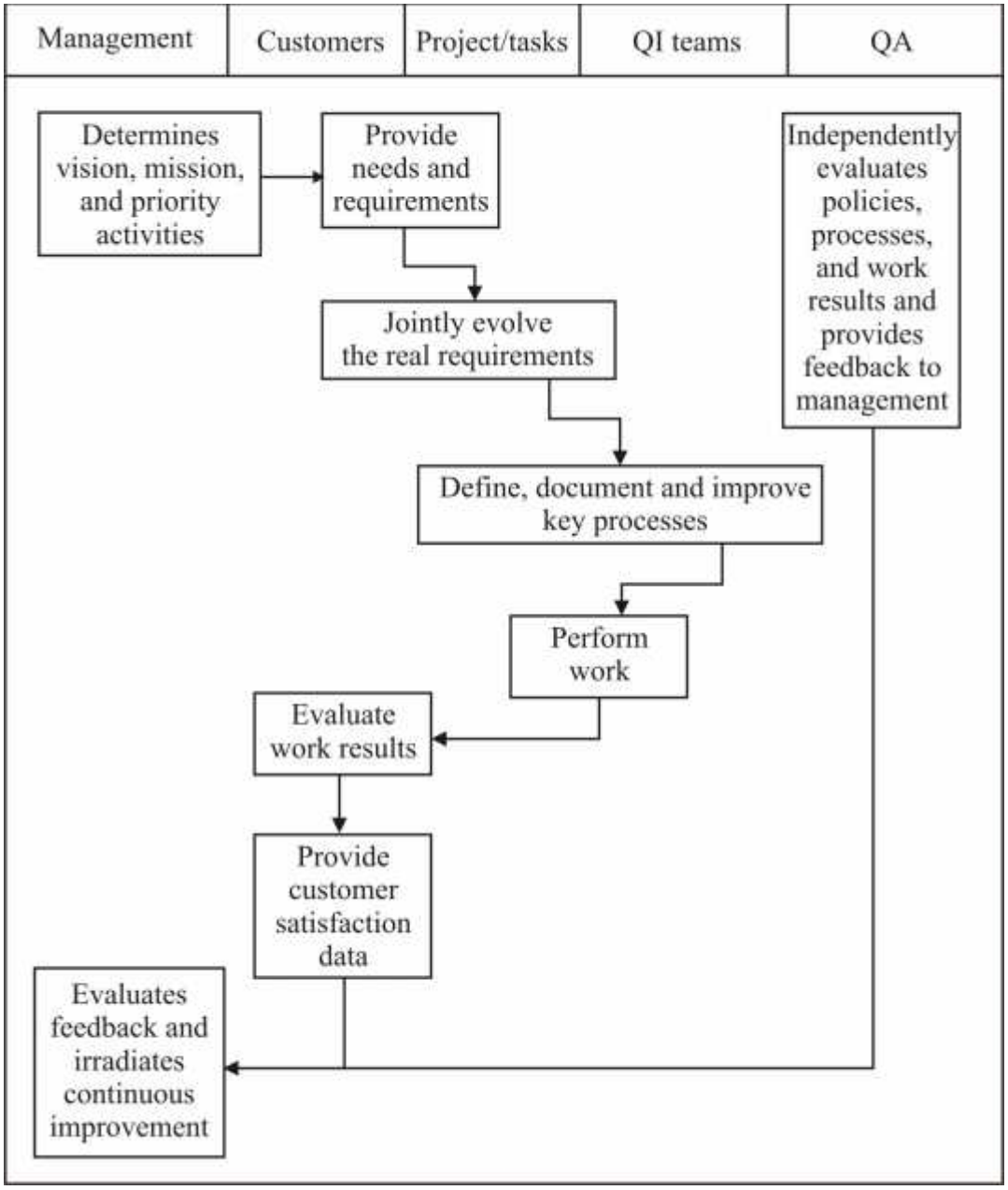


Figure 2.5: How the components of an integrated quality approach work together.

2.10 Quality Improvement Techniques

Regardless of the size of the projects, good project manager can make improvements on local projects unde3r their own initiative using one or more of the quality improvement techniques described below. But, if a business wants to improve the quality of its products or services, the most effective approach is do it from the top and implement these techniques across all projects. The best way to manage quality improvement is to establish a quality management board (QMB) as a management

team that can implement theses ideas at the top and, thus, lead the company down the road to quality by example. In the QMB, managers can determine appropriate organizational policies and quality and process improvement (PI) objectives. To accomplish their goals, they should implement plans for improvement and provide needed resources and skills. They should track the status of improvements, rewards teams and individuals for successes, and identify ways to transfer lessons learned and improvements to other parts of the organization. Regardless of the size of the organization, the QMB should set its agenda through easy-to-understand quality goals and should provide direction regarding the implementation of the following quality improvement techniques:

- **Quality Improvement and Process Improvement Models**

  By adopting a framework (such as the CMM or CMMI) as a standard for systems or software engineering and conducting annual evaluations of the current situation against the standard (**Figure 2.6)**, past experiences of organizations have shown that CMMs, in use since 1978, enable a systems or software engineering project or organization to perceive how it stacks up against what industry considers a best practice and whether or not improvements it has implemented are having the desired effect. Use the results to identify priority areas for improvement activities and initial continuous improvement initiatives, including QI teams where appropriate. Though it can take some planning, resources, and time to determine how the organization fits with the chosen process model, this investment will provide valuable information that can help steer improvements. It might be easier for larger organizations to absorb the expense of evaluations and improvements, but smaller organizations can look at their improvement program in strategic terms and look for other ways to implement improvements. For example, they may want to partner with other contractors or customers to accomplish their goals.

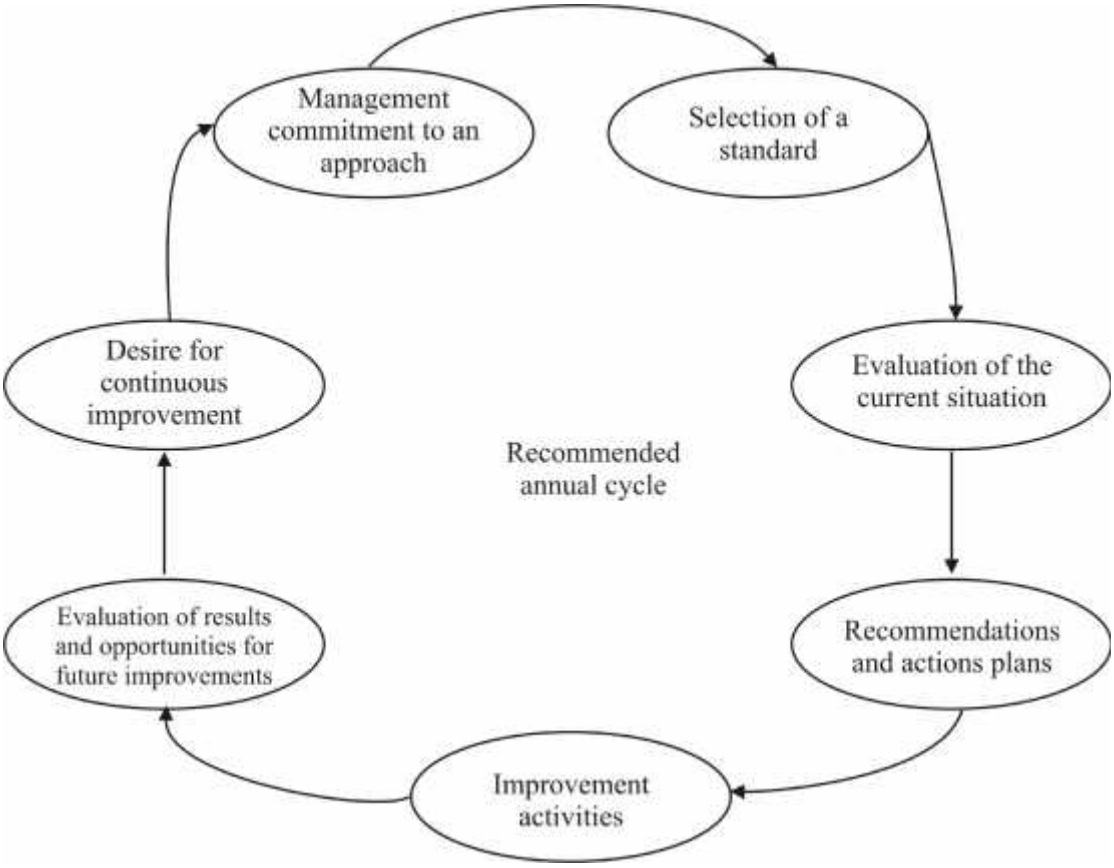


Figure 2.6: Quality Improvement Cycle

- **Training**

Regular and appropriate training is always a valuable investment for any size company. Customers demand that workers have the latest technology skills, and employees want to improve their professional development and performance. If organizations expect to continue to meet their customers' evolving needs and their employees' desire for personal and career growth, then management must take responsibility to ensure this happens. Smaller or medium-size organizations might have difficulty (through lack of resources) establishing an organizational training program. Partnering with local colleges or universities for lower rates may be an option they could explore.

- **QI Teams Using the QI Story**

Though always conscious of the bottom line, large companies have more leeway in terms of resources to staff and fund QI teams. Because they have

less staff and smaller budgets, small and medium-size projects or companies need to be judicious in the establishment of teams. At the same time, because they must operate their businesses and respond to customer demands and deals with chronic quality problems, they should establish QI terms to attack only what senior managers feel are the most critical company problems. In other words, smaller organizations should establish teams to deal with those problems that hamper their ability to do business or meet customer demands.

- **Customer Satisfaction Surveys (e.g., by Phone)**

By considering providing a mechanism to deal immediately with customer dissatisfaction, such as "red alert procedures" to escalate concerns, deal with them, and provide feedback to the customer. Large projects or companies have established mechanisms and tools to track and manage customer satisfaction issues. Managers can take advantage of existing resources to collect and analyze the information and use it to improve or to win new business. Even though they may not have the advantage of a corporate approach against what industry considers a best practice and whether or not improvements it has implemented are having the desired effect. Use the results to identify priority areas for improvement activities and initiate continuous improvement initiatives, including QI teams where appropriate. Thought it can take some planning, resources, and time to determine how the organization fits with the chosen process model, this investment will provide valuable information that can help steer improvements. It might be easier for larger organizations to absorb the expense of evaluations and improvements, but smaller organizations can look at their improvement program in strategic terms and look for other ways to implement improvements. For example, they may want to partner with other contractors or customers to accomplish their goals.

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- **Employee Satisfaction Surveys**

Learning about employee concerns thought objective data and acting on the results builds employee loyalty and improves retention. As with the customer satisfaction surveys, larger companies use considerable resources to address employee issues and to retain their workforce. They know that these resources have feet and can leave at any time to find better a work environment or opportunities for advancement. This is true for smaller companies as well, but it may be more critical to their business if a few skilled workers who are the core of their expertise in any given area leave to join the completion. Small business managers would do well to develop a short, 20 question survey to find out what is on the minds of their staff, to determine what works well in the company and what does not, and to identify areas for improvement. Such a survey does not need to be scientific, but to serve as a basis for management decisions.

- **QA**

In most large companies, having an independent objective view concerning policy and process compliance and use in the organization provides valuable feedback on quality improvement and process improvement efforts or points to other problems that might not have their immediate attention. This makes it possible to have a trained QA staff available to support any size project or team as a matrixes function. Smaller organizations may not have the trained personnel or budget to support a full-time QA staff or a matrixes organization from which they can assign QA. In those cases, it is recommended that the entire project team adopt a quality team strategy, where all the members of the team are responsible for the quality of the work they perform and the products and services they provide. In his environment, each staff member must

perform reviews or audits on another team member's work product or service and on the process used. This approach requires that each team member be trained for his or her QA role and that a corrective action system be in place that tracks the status of problems found in QA reviews and deeps management informed. Managers must take special care to ensure that reviewers can prove their objectivity in their roles as QA (a main requirement of the CMMI) and that they are not directly involved in the proves or product they are reviewing.

- **Process Design, Management, and Improvement**

A process is a set of activities that results in the accomplishment of a task or the achievement of an outcome. Any size organization should use process as one of the fundamental building blocks in its work. Larger and more complex projects require more detail in their documented processes and show the roles and responsibilities of all groups who are involved in the process. For obvious reasons, getting large groups of people to work together to meet shared goals can be more of a challenge. On the other hand, smaller project teams have an advantage since they may be able to rely on less detail in their documented process. For example, they can use checklists or simple process flowcharts. Having fewer people on the project team makes it easier to determine what the desired outcome of the process I, what inputs and outputs are required, and the specific process steps that need to be followed. Having small teams also makes it easier to train and to make desired changes.

- **Monitoring Performance through Metrics**

Managers need to make decisions based upon data. Sometimes this data can be qualitative or quantitative. For any size organization to improve, it must have quantitative data on which to base its improvements. It is an unwise manager who decides to expend resources to implement a quality improvement when he or she does not know if such an improvement is needed. For quality improvements and process improvements,, managers need to set reasonable objectives (that they have a good shot at making) and identify measures they can use to determine whether or not they have met tat goal. Examples of potentially useful metrics include business win rates, customer satisfaction

ratings, and a customer loyalty index. The later can be generated as simply as by asking three questions: (1) how do you rate our quality? (2) What is the likelihood of your continued business? (3) What is the likelihood of your recommending us to a new customer?

- **QI Techniques**

QI techniques such as brainstorming, motivating, Pareto analysis, barriers and aids analysis, action plans, cause-and-effect analysis, checklists, the QI story, and PDCA (discussed below) are easy to learn and invaluable in a forward-looking organization.1 These techniques can work well in any size project or organization, as long as the group is trained to use the technique and the results of the exercise.

- **QI Story**

The QI story, developed by Quilted Quality Services (now part of Six Sigma Quilted), provide a structure for tackling priority activities and problems. As mentioned above, because they have fewer resources, smaller projects or companies should be judicious in the use of the QI story to solve problems; they should identify problems that will be the most cost-effective to solve. A modified set of steps is as follows.

a) Identify the reason for improvement.
- Determine the nature of the problem.
- Collect data.
- Identify key processes.
- Develop a plan and schedule.

b) Analyze the current situation.
- Identify customer's real requirements.
- Set a target for improvement.

c) Conduct analysis.
- Identify probable root causes of the problem.
- Select root causes that seem to have the most impact.
- Verify the selected root causes with data.

d) Select countermeasures that attack the verified root causes.

- evaluate whether the countermeasures will do the following:
- Address the verified root causes;
- Impact the customers' requirements;
- Prove to be cost beneficial.

e) Develop an action plan to implement the selected countermeasures.

- Obtain management approval.
- Coordinate with stakeholders to garner support and cooperation.

f) Implement the countermeasures.

g) Measure the results.

- Did the countermeasures work?
- Are things improving?
- Are root causes being impacted?
- Evaluate the results compared to the target for improvement.
- Implement additional countermeasures if needed.

h) Standardize an approach based on the results.

- What can be changed to ensure the problem does not recur (e.g., a new or revised policy, procedure, works process standard, training)?

i) Consider what lessons have been learned form performing the quality improvement effort.

- Should related problems be addressed?
- Should the approach for performing the QI story be revised?

2.13 Continuous Quality Improvement

Continuous improvement is an ongoing effort to improve products, services or processes. These efforts can seek "incremental" improvement over time or "breakthrough" improvement all once.

Among the most widely used tools for continuous improvement is a four-step quality model-the **plan-do-check-act** (PDCA)cycle, also known as Deming Cycle or Shewhart Cycle:

- **Plan**: Identify an opportunity and plan for change.
- **Do**: Implement the change on a small scale.

- **Check**: Use data to analyze the results of the change and determine whether it made a difference.

- **Act**: If the change was successful, implement it on a wider scale and continuously assess your results. If the change did not work, begin the cycle again.

Other widely used methods of continuous improvement-such as Six Sigma, lean and total quality Management – emphasize employee involvement and team work measuring and systematizing processes; and reducing variation, defects and cycle times.

2.13.1 The PDCA Cycle

A popular and useful paradigm utilized for quality improvement is the PDCA cycle in connection with assessing the value and usefulness of meetings. The idea is to plan the approach,("do") it, check on how things are working, act on the results of that checking, and continue the cycle. The PDCA cycle is shown in **Figure 2.7.**

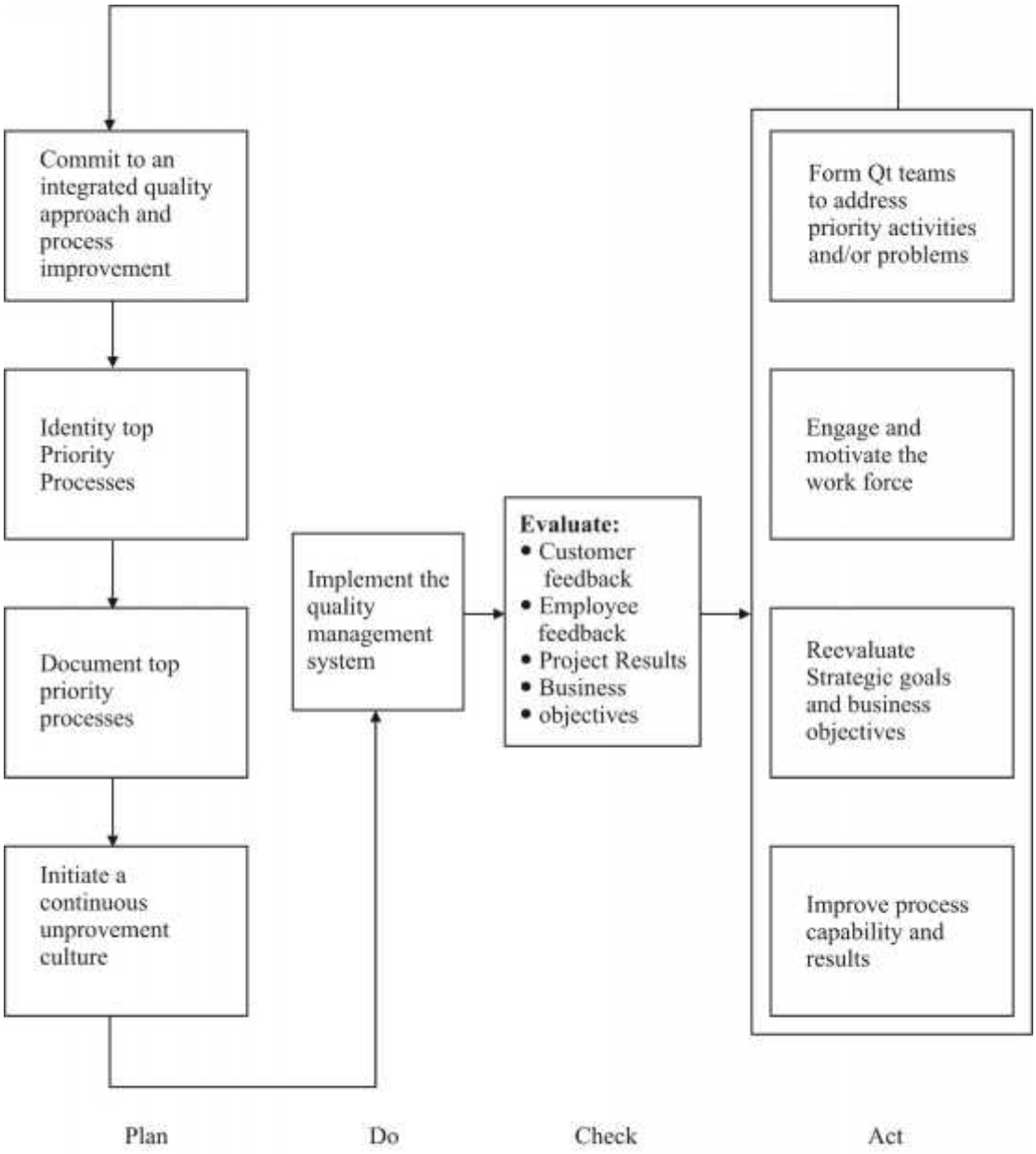

Figure 2.7: The PCDA Cycle

2.14 Designing a Process

A critical skill needed by the R is the ability to design and to improve processes-more specifically, to facilitate process design and improvement sessions. A process as a set of activities that result in the accomplishment of a task or the achievement of an outcome, have been referred to the requirements process, a full system life-cycle set of activities that includes the following:

- Identifying requirements;

- Understanding customer needs and expectations;
- Clarifying and restating the requirements (evolving the real requirements);
- Analyzing the requirements;
- Defining the requirements;
- Specifying the requirements;
- Prioritizing the requirements;
- Deriving requirements;
- Partitioning requirements;
- Allocating requirements;
- Tracking requirements;
- Managing requirements;
- Testing and verifying requirements;
- Validating requirements;

Process design and process improvement are activities that do the following:

- They involve stakeholders (those who have an interest) in deciding how things should be done, thus gaining their buy-in to the implementation, use, and continuous improvement of the process.

- They enable a project or organization to become increasingly proficient. Once a process is documented, everyone can understand it, and it can be done repeatedly in the same way with the same results. Also, improvements can be suggested, discussed, and incorporated.

Designing a process is straightforward in which the process to be documented are represented and the template is created as in **Figure 2.8.**

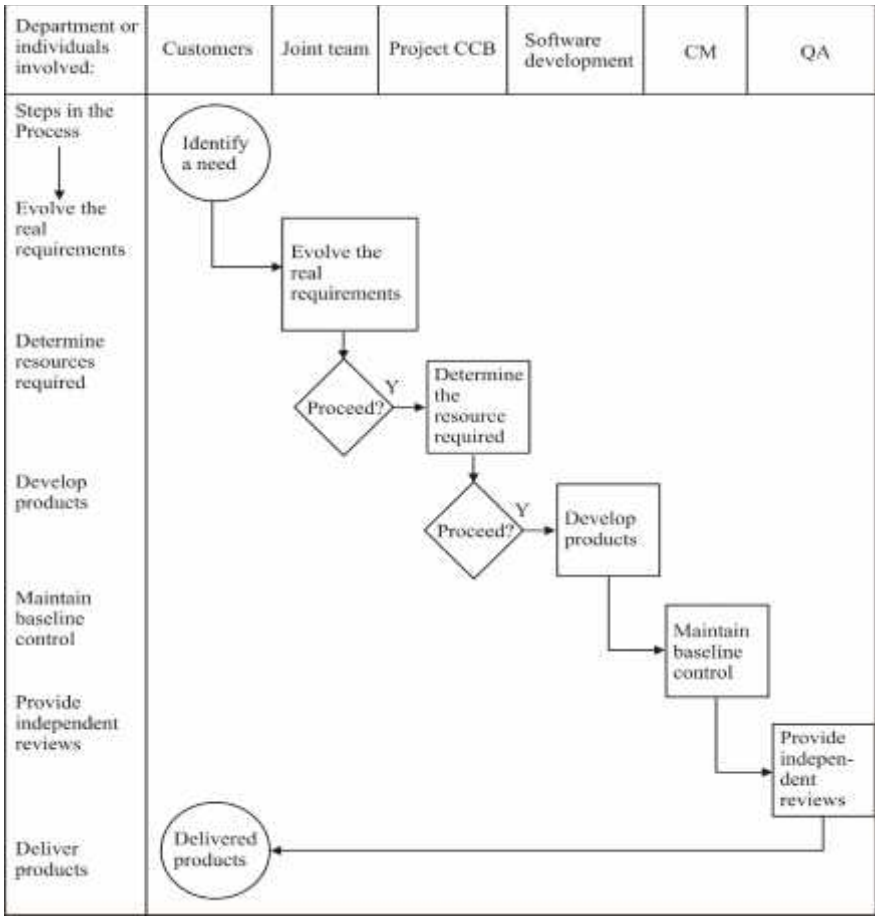

Figure 2.8: Process design flowchart template with simplified product development process.

2.13 Most Popular Specialist Software and QI Tools

There are several QI requirements tools developed by many vendors. Some of them are:

Some of the Specialist Software is as:

Software	**Vendors**
Arena	Rockwell Software
Auto Mod	Brooks-PRI Automation
Awe	Sim Frontsteps, Inc.
Enterprise Dynamics	In coltrol Enterprise Dynamics
Extend	Imagine That, Inc
Flexsim	Flexsim Software Products, Inc.
GPSS/H	Wolverine Software Corporation
Micro Saint	Micro Analysis and Design
Pro Model (Med Model, Service Model)	Pro Model Corporation
Quest	DELMIA Corporation
Show Flow	Web Systems Limited
SIGMA	Custom Simulation
Simprocess	CACI Products Company
Simiul 8	Visual 8 Corporation
SLX	Wolverine Software Corporation
Visual Simulation Environment	Orca Computer, Inc.
Witness	Lanner Group, Inc.

Table 2.1: List of Specialist Software by Different Vendors

QI Requirements Tools

Software	Vendors
DOORS	Telelogic
Requisite Pro ("ReqPro")	IBM (Formerly Rational) Corporation
Caliber RM	Technology Builders (TBI) [now Star team system requirements by starbase],
CORE	VITECH Corporation
RTM Workshop	Integrated Chipware
Vital Link	Compliance Automation

Table 2.2: List of QI Requirement Tools by Different Vendors

As emphasized earlier, the RA must become familiar with and experienced in using an industry-strength automated requirements tools. (By industry-strength means a requirements tool that provides the capabilities required to develop systems and software).

2.14 Reviews from Books and Articles

1.14.1 Review from the Book Management Information System

Quality Information Systems

Quality information Systems are standalone systems or embedded systems that help an organization to achieve its quality goals. The quality plan is derived from the strategic information plan.

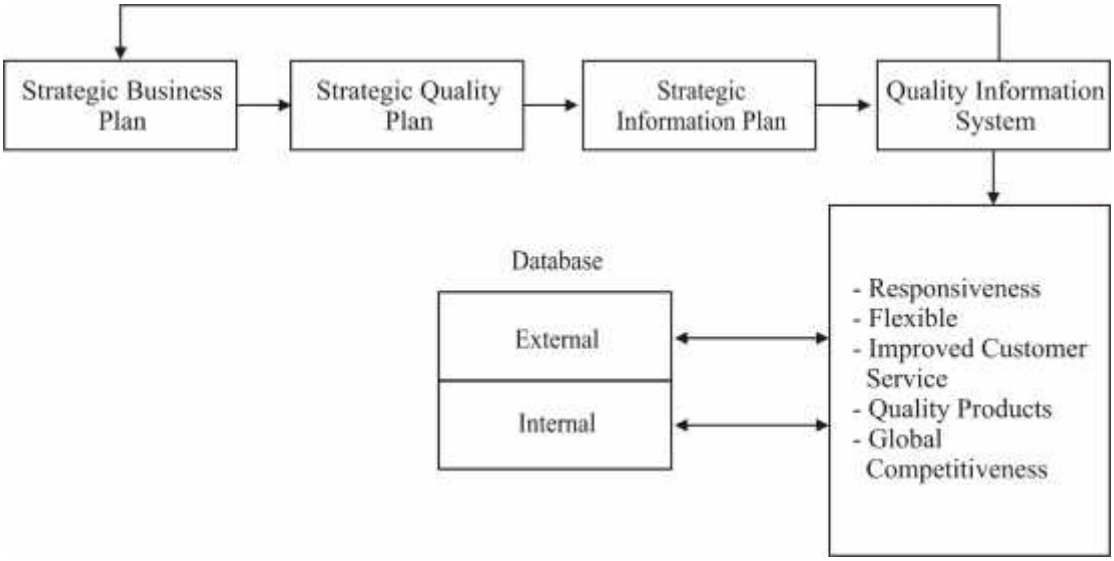

Figure 2.9: Quality Information System

The figure above shows how the strategic quality plan is derived from the strategic information plan. In some cases, a firm has no separate quality plan, but instead makes quality a component of other plans, such as marketing, manufacturing, and so on. The information system (IS) department plays a major role in ensuring the success of TQM efforts in an organization. An information system can promote quality and provide tools and techniques top help the firm achieve its quality information also help firms achieve quality certification. There are many institution and agencies that certify the quality efforts of an organization and provide guidelines to firms that plan to instill quality in all aspects of their operations.

The role of IS may vary from one organization to the next, or even from one program to the next, but there are four major areas where IS plays an important role in the certification process. They are: partial systems overhaul, full systems overhaul, training, and oversight. In a partial systems overhaul, existing systems are partially revamped in order to update them and make them more responsive to the changing needs of decision makers. Partial systems overhaul may include providing users with better interfaces, better end-user support, or better integration of existing systems.

In a full systems overhaul, the old system is replaced with a new system. This may sometimes be necessitated by outdated equipment or systems that can no longer be updated or maintained.

Training is another area where IS can play an important role in quality certification. Users must be well trained in systems that are partially or fully overhauled, because this ahs a direct impact both on quality and on productivity. More important, good data come from well-trained users and good data form the basis of good decisions. Overall, the information systems should oversee the entire quality certification process; this is often a time consuming task. It requires facilitating role by ensuring the free flow of information between decision makers. Often, organizational data and information have to be sent to external agencies and IS plays a critical role in getting the right data to the right people at the right time.

2.16.2 Review from the Book

Continuous Process Improvement (CPI)

CPI is the continuous monitoring of business process to effect small but measurable improvements in cost reduction and value added.

In a sense, CPI is the opposite of Businesses Process Redesign (BPR). Whereas BPR intended to implement dramatic change, CPI implements a continuous series of smaller changes. Continuous improvement contributes to cost reductions, improved efficiencies, and increased value and profit. Systems analysts may be called on to participate in CPI initiatives for any business process, including the design and implementation of improvements to information technology and applications that support the process. (*"System Analysis and Design Methods" by Jeffrey L. Whitten, Lonnie D.Bentley, Kevin C.Dittman)*

2.16.3 From the Article:

Since the early 1980's total quality improvement (TQI) has revolutionized the way in which health care organizations deliver care. Core TQI principles and tools such as process analysis, the use of the scientific method and statistical techniques applied to real world problems have been used to understand and improve healthcare delivery. Many of these TQI approaches have been effectively used to make changes to healthcare delivery and span the continuum from incremental to radical redesign. Over the last few decades, new ideas, methodological approaches and innovative technologies have entered the field of healthcare. The introduction of these new

innovation has provided health professionals, administrators and information systems to redesign patient care processes with a perspective that not only focuses on improving the quality of patient care but also addresses rising healthcare costs. Historically, health information systems have been implemented in health care settings in order to automate processes and collect much needed data about existing health care processes in order to understand their nature and improve them. This data was used to identify common and special cause variation. In identifying these types of variation health care professionals (i.e. physicians, nurse, administrators and informaticians) were able to understand, review, redesign and engage in statistical process control. Such efforts led to significant health care system improvements. More recently, such improvements arising form health information system collection of data have lead to gains that have been more incremental in nature. This has led many to explore the use of health information systems in radical redesign of processes much like that employed by the manufacturing and retail industries. This workshop will introduce participants to current concepts and methodologies arising from the health care quality improvement and introduce students to radical process redesign approaches from the manufacturing and retail industries while examining their potential application to healthcare.

Continuous Quality Improvement

Management's days in health care are numbered. Medical group administrators can no longer rely on expanding revenues by increasing the client base, adding physicians or tweaking fees. Instead, the major challenge facing health care management today is to do more with less. Given this challenge, about Continuous Quality Improvement (CQI) should be thought as an answer.

Shortcomings of CQI Programs

There are several shortcomings of CQI. They are us:

No game plan: Without a way integrate the quality process with business goals, the quality effort is scattershot and lacked relevance to the organization as a whole. Employees learned techniques of QI but had no infrastructure allowing them to be put to use.

Physician involvement: Lack of physician participation meant playing with half a team. Train and drain: Employee quality training is wasted when it is not put to immediate and relevant use.

Lack of accountability: Without clearly assigned responsibilities, QI efforts faltered. The lack of a quality process leader often meant the collapse of the program.

2.16.4 Quality "show dogs": Isolated improvements looked good but did not significantly affect quality in ways that mattered to the organization. Small successes are common but significant breakthroughs are rare. *(By Elizabeth M. Borycki, School of Health Information Science, University of Victoria Alyse Capron, Vancouver Island Health Authority.)*

2.17 Reviews of Master's Degree Thesis

A. "Implementation of Management Information System in Royal Nepal Airlines Corporation RNAC" (A Case Study in Marketing Department)

Have Major findings as followings:

a) Royal Nepal Airlines is one of the complex organizations due to its nature of service and wide area of marketing activities.

b) Marketing Department of RNAC has a multidivisional structure but in reality the structure is ambiguous.

c) The information system in Marketing Department is based on Traditional paper based information and manual filling system. Manual flow of documents except computerized Reservation System of International flight ticket through ABACUS and other CRS software.'

d) Lack of capable manpower and IT experts to handle sophisticated information technology to maintain proper information system within the department.

e) Centralization of authority, manual flow of documents and unnecessary political pressure generally creates obstacle to perform marketing activities smoothly.

f) Information accounted in Nepali medium through Radio Nepal regarding flights schedules by the Marketing Department is quite traditional.

g) Lack of proper informational infrastructure to communicate with different domestic stations causes problems in planning flight schedules.

h) Micro computers in each division are not utilized. They are used only to keep records to some extent and used to type material whenever needed in order to submit the report to the department director and CEO.

i) Information does not flow systematically due to absence of Network-based computerized information system to coordinate and communicate with different divisions and units of the marketing department.

j) MIR unit of Marketing Department generally accumulates the information from different divisions and compiles them in a given format and prints out to submit the weekly and monthly information report.

k) Due to mishandling, misunderstanding and information gap; frequent flight delay, flight cancellations and changes in flight schedules are common.

l) Network-based computerized information system is necessary for the systematic flow of information.

m) Traditional paper-based information system creates delay in making decisions. It should be elimainated through computerized information systed.

n) It is difficult to implement MIS due to lack of necessary infrastructure of the Marketing Department of RNAC such as:

   a. Lack of equipment & accessories

   b. Lack of technical manpower

   c. Lack of IT experts

   d. Budget for installation of new technology etc. *(Ishwar Acharya)*

B. " A Study on Micro Computers and Computerization in Nepal"

Have major findings as following:

a) There is an increasing trend and good scope for the use of microcomputers in Nepal. It is estimated that the total micro-computers at the end of 1986 will be approximately 610. the apple Mac Computer has taken a good portion of market share from the very beginning but it is estimated that IBM computers are going to be in number one position by 1987.

b) Micro-computer users are mostly business organizations, foreign projects, foreign organizations, government offices and corporations in Nepal.

c) After the introduction of micro-computer in the organization, the average productivity has gone up to 51.5% in particular field. A quite good numbers of users have said that there is no effect because they have not been able to use it due to lack of training or technical or administrative problems.

d) The computer users' motivation towards computerization using micro-computers is due to the growing need of the organization and the low cost of micro-computers. Thus they are not buying it as a fashion.

e) The micro-computer users/operators are trained for an average of 2.32 months only. About 81.2% users / operators think they need further training to carry out their jobs independently.

f) There are 36 varieties of microcomputers available in the country ranging from very popular brand names to newly introduced computer and some compatibles.

g) The computer user has procured their micro-computer considering mainly price, brand name and availability.

h) The major field of computer application by NCC to its customers are mainly.

a. Accounts and Banking

b. Education

c. Engineering

d. Household use

e. Health

f. Agriculture and Land

g. Population and others

i) The micro-computer is used in a daily average of 5.25 hrs. Most of the microcomputers are being used for the following major tasks:

1. word-processing
2. spreadsheet
3. accounting
4. statistical analysis
5. software development

j) Most of the micro-computers have problem of power failure and diskette problem and losing data. The other type of major problems is reliable maintenance and repair services. *(Yadhav Pradhan)*

C. "MIS and the Role of NCC in meeting the needs of Nepalese Manger"

Have major findings as follows:

a) The most considerable point there is that NCC's role is ever increasing in Nepal considered in light of the day by day increasing number of users, and complex fields of computerization. It means that the NCC's role in Nepal is unlimited because of management complexities. That's the reason why NCC will have to be running beyond the data processing task.

b) The trend of management complexities and fields to be computerized indicates that the present compute system cannot fulfills the necessities and more powerful systems should be installed in Nepal.

c) Mostly, difficulties with the present system have occurred not only because of inadequately-trained manpower but also because of inadequate computer capacity and facilities. So, a powerful computer system has to be installed in Nepal.

d) Most of the existing problems have been found to be removed by installation of 4^{th} generation computer based upon the NCC's evaluation.

e) By the NCC's suggestion, it has also been found that NCC has helped the user's organization reduce time and cost" to a large extent". This is proved by ever-increasing demand for computerization form the regular and new users. As a result, NCC has also to got for a more powerful and versatile computer system installation in Nepal. *(Shambhu Kumar Thapa)*

D. " A Study on training needs of the employees of RNAC"

Have major findings as followings;

a) Training is a means to develop required skills and also is helpful for changing attitudes in the desired direction. Training can be technical or non-technical. So, there is no doubt that the employees at all level, all categories, and d fields require relevant training.

b) From the study, it is clear that more emphasis has been given to train the employees of the Technical Group than the Financial Group and least priority has been given to administrative and other non-technical groups.

c) The present study shows that some trained employees of the Technical Group and Administrative group are not utilizing their skills in their present job functions. Only the trained employees of finance Group are utilizing their skills in their present job functions.

d) The existing selection criteria for training at RNAC seem to be a matter of dissatisfaction among the employees of all group as well as all levels. The study finds out that there is a need for a new system for selection criteria for training in RNAC.

e) The employees of grade 1A and 1B working as aircraft learners and aircraft stores loaders are generally transporting aircraft parts from the technical stores to aircraft, receiving section to technical stores, and technical stores to various RA workshops and vise versa without any training. Due to this, there is a great risk of important parts being damaged due to mishandling. RNAC must take immediate action to rectify this problem. *(Purna Bahadur Mahat)*

E. " A study on Manpower Planning of RNAC"

Have major findings as followings:

a) RNAC does not have scientific and proper techniques of staff enrolment, promotion, transfer and retirement. Its employees are not satisfied with the existing system of the organization. Staff development opportunities are meager and there is an obvious lack of job-security.

b) The employees do not find a favorable atmosphere for the utilization of their knowledge and skills. Training is not properly utilized for achieving goals of the organization.

c) The corporation does not have a fair selection of staff and there are no regular advertisements for the vacant positions.

d) No study has been done on future needs of manpower. The corporation does not have a system of forecast of its manpower needs and their type so as to foresee with the projected supply in accordance with its expansion of domestic and external service. The drawbacks are leading to over-staffing, primarily on temporary and contract basis. *(Bhaskar Bahadur Subedi)*

A study of Fringe Benefits in RNAC

Have major findings as followings:

a) Paid leave days are too may, but other benefits are lacking in the corporation. There is also a poor management and publicity of the jet in foreign countries.

b) RNAAC is not giving proper benefits to its employees. But as far as every human being is a subject to same feelings, pains and emotions. So, efforts should be made by the management to implement the new benefits which will really stimulate the inner drives of the employees.

c) There is a significant relationship between increase in the percentage of fringe benefits and the increase in the percentage of salary.

d) There is a significant relationship between increase in the cost of fringe benefits and the increase in the total revenue over the total cost.

2.18 Research Gap

The critical role that IT is coming to play in modern life is generating a new broder agenda for IT education and research. While computing was formerly if concern mainly to engineers and scientists, the military, and back-office business managers, now it is something that everyone experiences and whose misuse or failings can have profound effects on society. Some gaps in past research landscapes have been identified that will be motivating innovations to academicians and researchers:

a) Students and employers require new knowledge-and-skills profiles; not infrequently, students who are interested in computing careers find computer science too narrow, mathematical, and physical-science oriented, while MES is insufficiently deep in technical content and too focused on traditional business topics and culture. This represents an ***intellectual gap*** in our educational frameworks. To the extent that the bodies of knowledge, which can fill the gape, are incomplete, this gap also signifies a need for research.

b) It centers on expertise in current technologies and how to apply them to solve problems but not on to improve the quality control systems.

To help address these challenges and continue to keep the research and education current, MIS program should continue to play a leadership role to shape the future of IT leadership, career development, quality improvement and research. MIS structure should help to direct the research and educational programs to meet the quality standards.

Embarking on an ambitious mission to Shape the Future of IT, volatility in the marketplace should be recognized as seen by the distribution of a firm's operations and business processes across the globe. To understand the impact of this volatility on the IT field and help shape future research and educational goals, the MES involvement and participation across multiple disciplines such as law, life science, education, government, and business is indeed invaluable to set new agenda for quality improvement systems and future of our country as well.

However many research studies have been conducted relating to MIS, but there is no such research studies where MIS is used to improve and measure the quality. So this study has tremendous opportunity to delve deep into this subject matter which is the interest of mine as well as to others.

CHAPTER-III

RESEARCH METHODOLOGY

3.1 Overview

Research Methodology involves the use of qualitative data, such as interviews, documents, and participant observation data, to understand and explain social phenomena. Due to the variety of approaches, methods and techniques in Information Systems, there has been a general shift in IS research away from technological to managerial and organizational issues, hence increases the interest in the application of quality research methods.

This section is organized as follows. After a general overview of research methodology, data collection methods are discussed. This is followed by sections on research methods, research techniques, and modes of analyzing and interpreting qualitative data.

3.2 Methodology of the Study

This thesis is prepared by collecting data by different methods. To achieve the objectives of the thesis, methodology has been proposed to follow which included source of data, data collection methods and data processing techniques by using data analysis tools etc.

3.3 Sources of Data

Both primary and secondary sources of data are collected for this thesis work. The method of data collection process can be further explained as:

3.3.1 Primary Source

The data collection methods used for primary sources mainly performed is structured interviews, informal discussions, self administered questionnaire and personal observation.

3.3.1.1 Structured Interviews

Structured interviews with the concerned authority are conducted. At first, a structured list of question to be asked during the interviews is formulated. Then they are prioritized according to the importance of the question.

3.3.1.2 Personal Observation

During the exploratory phase, with a considerable time with NMC, Teaching Hospital, conversation with the concerned employees of NMC, Teaching Hospital has been conducted.

3.3.2 Secondary Source

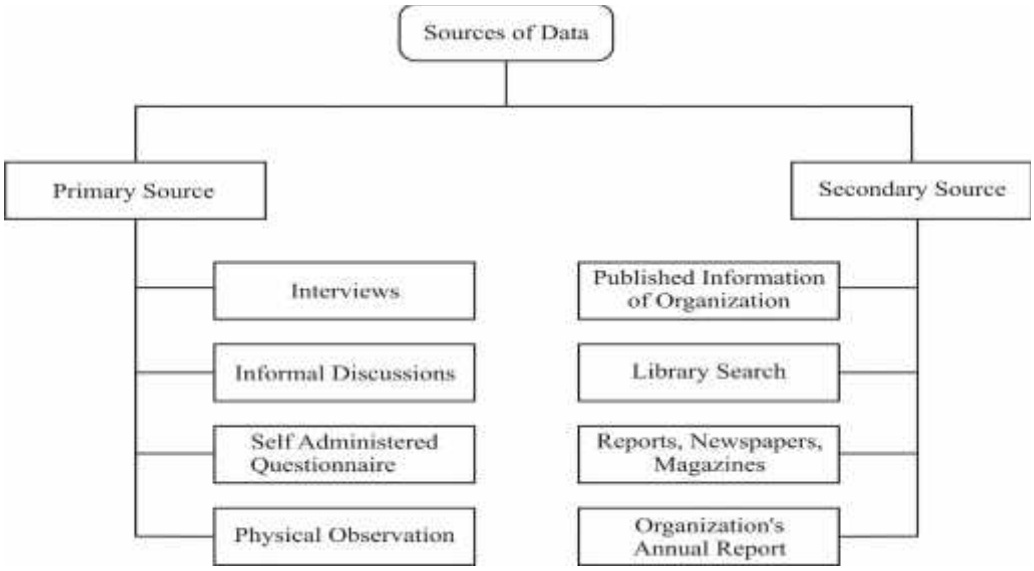

Fig 3.1 Sources of Data

The data collection method from secondary sources mainly is the brochures of NMC, Teaching Hospital. Data collected from the secondary sources are completely internal.

3.4 Current Data

Very little data about the processes and the only statistics of NMC, Teaching Hospital from the annual Statistics Report (Annex 3), are included for the number of items required for the processes. While this provides a rough estimate, it by no means represents the entire picture.

To gather additional data, flowcharts of the process are created and brain stormed questions for a survey of local practices.

3.5 Local Survey

The local survey went through several iterations and some testing is satisfied with it. the survey showed both similarities and differences among practices at the NMC, Teaching Hospital.

3.6 Data Processing Technique

All collected data are in raw stage unless they are processed. They do not give any meaning or conclusion without processing. Thus data are corrected into meaningful form. The data is carefully studied and analyzed so as to meet the objectives of the study.

Data Flow Diagram

After collection of sufficient data it is processed into information. All collected information was presented in Data Flow Diagram. DFD is a graphical tool used to describe and analyze the movement of data and information in the system. Gane/Sarson DFD are used to show the data and information in the system under study.

DFD Notations

Process	Rectangle
External Entity	Solidified

Data Flow Arrow

data Store Open Ended Rectangle

- **Processor** indicates a processing function in which data flowing in are changed in from, value or location before existing.
- **Entities** indicate the input output from the system.
- **Data flow** indicates data flowing through the system.
- **Data store** i.e. open-ended rectangle indicate data store such as a database file.

E-R Diagrams

Data models are used in analysis to describe the data requirements and assumptions in the system from a top-down perspective set the stage for the design of databases later on in the SDLC.

Entities are represented as rectangular boxes and relationships as lines connecting boxes. The symbols used for the basic ER constructs are:

- **Entities** are represented by labeled rectangles. The label is the name of the entity. Entity names should be singular nouns.
- **Relationships** are represented by a solid line connecting two entities. The name of the relationship is written above the line. Relationship names should be verbs.
- **Attributes,** when included, are listed inside the entity rectangle. Attributes which are identifiers are underlined.
- **Cardinality** of many is represented by a line ending in a crow's foot. Is omitted, the cardinality is one.

- **Existence** is represented by placing a circle or a perpendicular bar on the line. Mandatory existence is shown by the bar (looks like a 1) next to the entity for an instance is required. Optional existence is shown by placing a circle next to the entity that is optional.

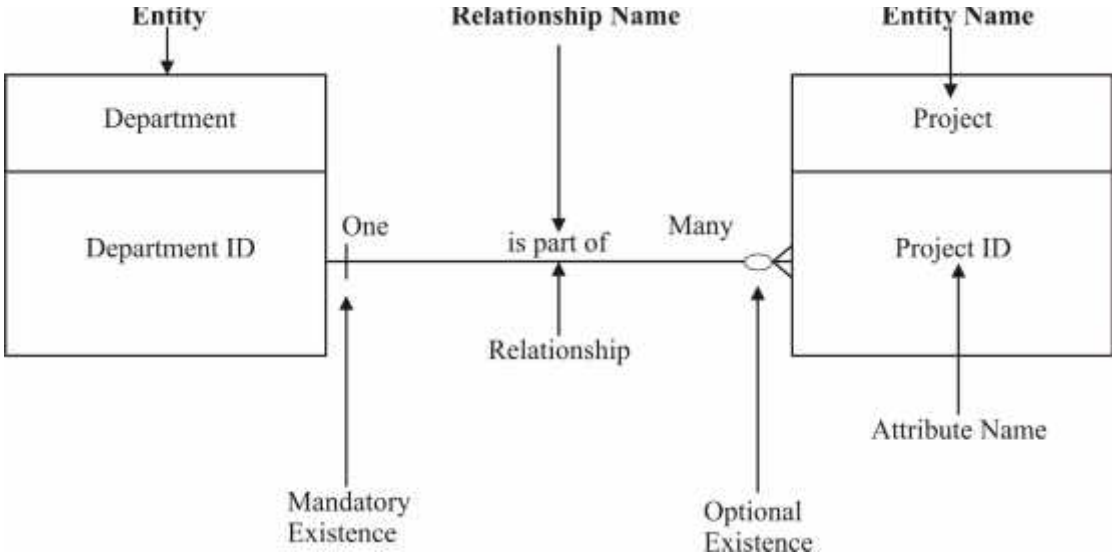

Fig. 3.2: ER Diagram Notations

3.14 Procedures for Quality Improvement Systems

There is no quality improvement with measurement. So, current performance is established before embarking on quality improvement process, so that it will have baseline form which it can determine if its efforts have yielded any quality improvements.

For undertaking continual improvement, following procedures are followed as:

a) Determining the existing Work Processes (current performance)

b) Identifying the Key Work Processes

c) Selecting a need (Key Process) to improve

d) Obtaining Commitment and Assigning Ownership

e) Creating Customer-Supplier Relationship

f) Identifying What to Improve

g) Developing a Review Process

h) Defining initiation of Test Solutions (quality improvement process) that will accomplish the Improvement Objective

i) Producing Improvement Plans which specify how and by whom the changes will be implemented

j) Identifying and Overcoming any Resistance to the Change

k) Implementing the change

l) Putting in place controls to hold new levels of performance and repeat form step first.

m) Carrying out research and analysis to discover the cause of current performance

3.15 Organizing for Improvement

Control improvement program are executed by teams that either diagnose problems, search for solutions or implement changes. These teams are within the NMC, TH. However there needs to be a steering group of managers which directs the teams towards their goal, and above all provides the environment for success.

3.16 Analytical Tools to be used

The portfolios of tools used for continual improvement are those which enable an organization to execute the above mentioned procedures. These include:

- Ishikawa fishbone diagram to examine cause and effect
- Pareto analysis to identify the influences on a situation which have the biggest impact
- Scatter diagram to display the forces for and against change
- Charting techniques to demonstrate whether improvement is being achieved

3.17 Data Sampling

Sampling, a selection of a set of elements fro a population or product lot, is used because data on every member of a population are often impossible, impractical or too costly to collect. So, it lets to draw conclusions or make inferences about the population from which the sample is drawn.

It is used in conjunction with randomization, which provide virtually identical characteristics relative to those of the population form which the sample was drawn.

However, three are some categories of sampling errors (these are accounted for by knowledgeable practitioners.):

- Bias (lack of accuracy)
- Dispersion (lack of precision)
- Non-reproducibility (lack of consistency)

Determinations of sample sizes for specific situations are obtained through the selection and application of the appropriate mathematical equation. All that's needed to determine the minimum sample size is to specify:

- If the data are continuous (variable) or discrete (attribute).

- If the population is finite or infinite.
- What confidence level is desired/specified.
- The magnitude of the maximum allowable error (due to bias, dispersion and/or non-reproducibility).
- The likelihood of occurrence of a specific event.

3.18 Cause Analysis Tools

There are many causes analysis tools. Among them, following tools are used in this thesis.

3.18.1 Fishbone Diagram

Fishbone Diagram is also called as Cause-and-Effect Diagram, or Ishikawa Diagram. There are variations too they are: cause enumeration diagram, process fishbone, time-delay fishbone, CEDAC (cause-and-effect diagram with the addition of cards), desired-result fishbone, and reverse fishbone diagram.

The fishbone diagram is used to identify many possible causes for an effect or problem which helps to structure a brainstorming session and immediately sorts ideas into useful categories.

It is used for

- identifying possible causes for a problem;
- to eliminate a team's thinking that tends to fall into ruts

Procedure used for drawing f Fishbone Diagram

a) A Problem Statement (effect) is identified first. Writing it at the center right of the page. A box around it and a horizontal arrow running to it is drawn.

b) The major categories of causes of the problem is brainstormed as:

   - Manpower

- Material
- Equipment
- Procedure
- Others

c) The categories of causes as branches from the main arrow are drawn.

d) By brainstorming all the possible causes of the problem, finding: "why does this happen?", it is drawn as a branch form the appropriate category. Causes are written in several places for they relate to several categories.

e) Again finding "why does this happen?" about each cause, sub-causes are branching off the causes. Finding "why?" and generate deeper levels of causes, that indicates causal relationships.

3.18.2 Pareto Chart

Pareto chart is also called as Pareto diagram, Pareto analysis. There are some variations: weighted Pareto chart, comparative Pareto charts.

A Pareto chart is a bar graph. So, the lengths of the bars represent frequency or cost (time or money), and are arranged with longest bars on the left and the shortest to the right. In this way the chart is drawn to visually depict which situations are more significant.

It is used for

- analyzing data about the frequency of problems or causes in a process;
- there are many problems or causes, so to focus on the most significant;
- analyzing broad causes by looking at their specific components;
- communicating with others about data

Procedures used for drawing a Pareto Chart

a) Categories are decided to group items;

b) The appropriate measurement is selected, that is frequency;

c) The chart will cover One Work Cycle;

d) Then the data are collected and recorded in the category each time. (Or assembled data that already exist.)

e) The measurements for each category are subtotaled.

f) The appropriate scales for the measurements are determined. The maximum value is the largest subtotal form step 'e'. the scale is marked on the left side of the chart.

g) Bars for each category are constructed and labeled. The tallest is placed at the far left, then the next tallest to its right and so on.

h) The percentage for each category is calculated: the subtotal for that category divided by the total for all categories is calculated. A right vertical axis is drawn and labeled it with percentages.

i) Cumulative sums are calculated and drawn: the subtotals for the first and second categories are added, and placed a dot above the second bar indicating that sum. To that sum the subtotal for the third category is added, and placed a dot above the third bar for that new sum. The, proves is continued for all the bars. The dots are connected, starting at the top of the first bar and the last dot is made to reach 100 percent on the right scale.

3.18.3 Scatter Diagram

Also called: scatter plot, x-y graph

The scatter diagram graphs pairs of numerical data, with one variable on each axis, to look for a relationship between them. If the variables are correlated, the points will fall along a line or curve. The better the correlation, the tighter the points will hug the line.

It is used for

- Pairing numerical data;
- Dependent variable which have multiple values for each value of independent variable;
- To determine whether the two variables are related, such as to identify potential root causes of problems;
- After brainstorming causes and effects using a fishbone diagram, to determine objectively whether a particular cause and effect are related;
- Determining whether two effects that appear to be related both occur with the same cause;
- To test for autocorrelation before constructing a control chart

Procedures for making a scatter diagram:

a) Pairs of data are collected for which a relationship is suspected;

b) A graph is drawn with the independent variable on the horizontal axis and the dependent variable on the vertical axis. For each pair of data, a dot or a symbol is kept where the x-axis value intersects the y-axis value.

c) The patterns of points are observed to see if a relationship is obvious. For the data clearly forming a ling or a curve, the variables are correlated. If not, regression or correlation analysis can be used. Otherwise, steps d through g are completed.

d) Points on the graph are divided into four quadrants. For x points on the graph,

e) X/2 points are counted from top to bottom and a horizontal line is drawn.

f) X/2 points are counted from left to right and a vertical line is drawn.

g) For odd number of points, the line is drawn through the middle point.

h) The points are counted in each quadrant. (points on a line are not counted)

i) The diagonally opposite quadrants are added. The smaller sum and the total of points in all quadrants are calculated.

j) A = points in upper left + points in lower right

k) B = points in upper right + points in lower left

l) Q = the smaller of A and B

m) N = A + B

n) The limit for N on the trend test table is looked up.

o) If Q is less than the limit, the two variables are related.

p) If Q is greater than or equal or the limit, the pattern could have occurred from random chance.

3.19 Simulation Software, Computer Models and Statistical Tools

There are three options for developing computer models:

a) Spreadsheets,

b) Programming Languages, and

c) Specialist Software

Although these are the options for simulations, computer models and statistical analysis, only Spreadsheets are choused in this project.

3.19.1 Spreadsheets

Spreadsheet packages, such as Excel, provide some rudimentary capabilities for simulation modeling. It is relatively straightforward to develop a simple time-slice model using the basic capabilities of a spreadsheet.

In Excel, random numbers are generated using the "RAND" function. Samples are taken from empirical distributions using the "IF" function or more succinctly with a lookup function ("VLOOKUP" or "HLOOKUP"). Some functions for sampling form statistical distributions are provided by Excel, for instance, normal and gamma distributions. Various spreadsheet add-ins can be obtained that provide specific simulation capabilities. **Crystal Ball Software** is one of such add-in that provides capabilities for distribution sampling and modeling the progression of time which I studied and obtained in my special elective subject at my Bachelor in Engineering degree at IOE, Pulchowk Campus.

Beyond a very rudimentary level, however, programming capabilities are used within the spreadsheet, that is, macros or Visual Basic for Applications in Excel. It is also difficult to develop a model animation using a spreadsheet, although a basic display is done.

3.19.2 Programming Languages

Simulation models can be developed using general purpose programming languages such as Visual Basic, C++ and Java. The use of languages gives the modeler a great deal of flexibility in model design. It can be time consuming, however, since the modeler needs to develop the simulation capabilities from scratch. Modern programming languages such as C++ support object orientated approaches which can be beneficial for simulation modeling. Java is particularly useful for developing simulations that are to run across the World Wide Web.

However none of the programming languages has been selected in this project, all of them have been done in Spreadsheets along with Crystal Ball and VBA applications.

3.19.3 Specialist Simulation Software

The majority of the specialist packages could be described as visual interactive modeling systems (VIMS). VIMS enable a simulation to be built as well as run in a visual and interactive manner. The software provides a predefined set of simulation objects. The modeler selects the required objects and defines the logic of the model through a series of menus. The visual display is also developed through a set of menus. As a result, the modeler requires little in the way of programming skills, although most VIMS either link to a programming language or have their own internal language to enable the modeling of more complex logic. For the majority of models it is necessary to use the programming interface to a greater or lesser degree.

A more focused application package tends to be easier to use, possibly only requiring the entry of relevant data, but it obviously has a much narrower range of application.

However there are many tools (Table 2.1 and 2.2), which are very costly and not suitable for NMC, Teaching Hospital. So, this special purpose software is not selected and the cheapest application that is Spreadsheet (MS Excel) with VB for Application and Crystal Ball Add-ins is selected.

3.20 Criteria for Software Selection

Hardware/software requirements

Hardware platform required

Operating system required

Software protection (hardware security device?)

A availability of network licenses

Features for use on the World Wide Web

Model Coding and Testing

Ease of model development

Can a model be built and run in small steps?

Availability of debugging aids (e.g. syntax checking, consistency checking, trace)

Maximum model size

Maximum dimensions of objects (e.g. arrays)

Features for documenting a model

Availability of help facility

Availability of software wizard

Visual Features

Is the display concurrent with the run, or is it a playback feature?

Speed with which display can be developed Can user icons be drawn?

Availability of icon libraries

Ability to pan and zoom

Ability to located objects on the display

Smoothness of animation

Availability of 3D animation

Input Data and Analysis Features

Distribution fitting

Ability to sample from empirical distributions

Which statistical distributions are available?

Ability to import data from other software

Reporting and Output Analysis Features

Availability of standard reports for model objects

Availability of graphical reporting

Ability to develop customized reports

Ability to export results to other software

Statistical analysis of results

Experimentation

Probable run-speed

Run control (step, animated, batch)

Interactive capability

Number of random number streams available

Control of random number streams

Ability to perform multiple replications

Facilities for organizing batches of runs

Provision of advice on warm-up, run-length and multiple replications

Availability of an optimizer

Ability to distribute runs across networked computers

Support

Availability of a help desk

Availability of consultancy support

Type of training given

Frequency of software upgrades

What is in the next upgrade?

Quality of documentation

Pedigree

Size of vendor's organization

How long has the package been available?

Have similar applications been modeled with the package?

Number of users (in industry sector)

Geographic usage of the package

Availability of literature on the package and package use

Cost

Purchase price

Maintenance fee

Cost of support

Cost of training

Time to learn the software

Availability of lower cost run-only license

Although to meet all these requirements are not met, the best cost effective tool is Spreadsheet with-VB for Application and special ad-ins: Crystal Ball.

CHAPTER-IV

PRESENTATION OF INFORMATION AND ANALYSIS OF DATA

4.1 Overview of Quality Improvement System

Like many hospitals in our country, the National Medical Collage, Teaching Hospital, Birgunj, multi-disciplinary improvement has to be made as a step towards improving quality. And like many similar attempts in well-intentioned organizations, the IT team floundered because they lacked a systematic way to identify, analyze, eliminate and prevent problems. Initial enthusiasm waned as IT team members became discouraged about investing so much time with what seemed to be sporadic, temporary results.

Healthcare must be more customers focused because it is becoming it is becoming more market driven. National Medical College, which encompasses separate blocks of hospital, demonstrated that every one of the activities to be adapted to a customer-inspired quality improvement approach. Using this methodology, it made IT teams more effective, more focused, and more result oriented.

It identifies customers and their expectations, defines key processes, sets up effective process improvement teams, and establishes quantifiable measures to evaluate improvement. The methodology focuses on prevention by rethinking process activities to eliminate the real sources of problems and customer dissatisfaction.

The team along the way with consultation, training, coaching, and the use of the firm's proprietary software program, is the belief that only customers can define quality and that to be successful, an organization must meet and exceed customer expectation. The first step-and often the most difficult-is to identify and define key processes according to customer perceptions, not what management thinks is important to customers.

It should be started with the three processes customers listed as most in need of improvement: responding to complaints, the emergency department, and diagnostic testing. The activities are much more focuses and directed at making actual

improvements. It is gratifying to see us making quality changes that are visible and measurable.

Unlike many other healthcare organizations which often focus their quality improvement programs on patients, the needs of all customers inside and outside the organization should be considered. This means including some not traditionally thought of as "customers," such as physicians, families of patients, and students. Physicians as a top priority and the hospital initiated a comprehensive complaint system for M.D. s to register their concerns should be identified. " They are our suppliers and partners in giving healthcare".

4.4 Need Assessment of Information

Being educational institute delivering medical courses and services oriented industry, hospital, it should develop its flow of information in modern ways. But traditional system is used for information flow. So, modern technology should be used to get necessary and reliable data for Quality Control Methods.

However, the hospital is the most respected service industry; it should offer its services quickly and accurately. So the traditional system of improving quality should be replaced with new technique of quality improvement system.

4.5 Use of Information

Information system can help organization to shape its relationship with different environment system like economics, social, political system and group like suppliers, customers, competitor, labors, financial institutions, government agencies and communities.

The need of information system to improve its quality is mainly for organization is to support and guide management in decision-making process. The information is used in all the levels. The limited information in operational level after processing is transferred to the managerial level. After this in strategically level each and every information scrutinized and meetings are held between the related functioning and decision is made for the effective performance and quality control.

4.4 Data Processing, Storing, and Retrieval System

Data is the building block of the information system. So, due to this reason the data are handled very carefully and significant care is taken in building, the data as well as limited data sharing.

4.5 Redundancy/Lack/Misdirection of Data

The data should focus on the particular matter, which must be able to help management for decision-making process. The lack of relevant and real data cannot give effective output. The data may not be false that lead decrease in the certainty. If the data and information collected is misdirected then it leads the great loose of time and cost as well as it could generate serious problems like misunderstanding among people. Therefore, data must be real, accurate and sufficient for decision-making.

4.6 Context Level Monitoring System

The context level data flow diagram shows the flow of information from one department to another.

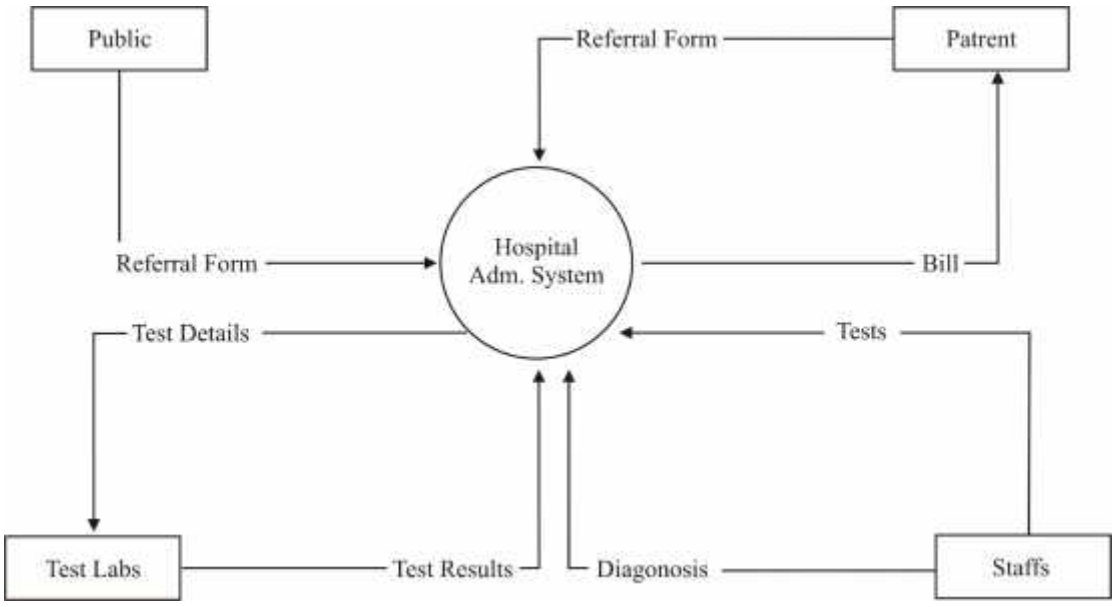

Fig. 4.1: Context Diagram of Hospital Admission System

4.7 System Level Data Flow Diagrams

As context level dataflow diagram system level data flow diagram shows the information flow in the main hospital. This is the dataflow diagram where the flow of information is shown in detail.

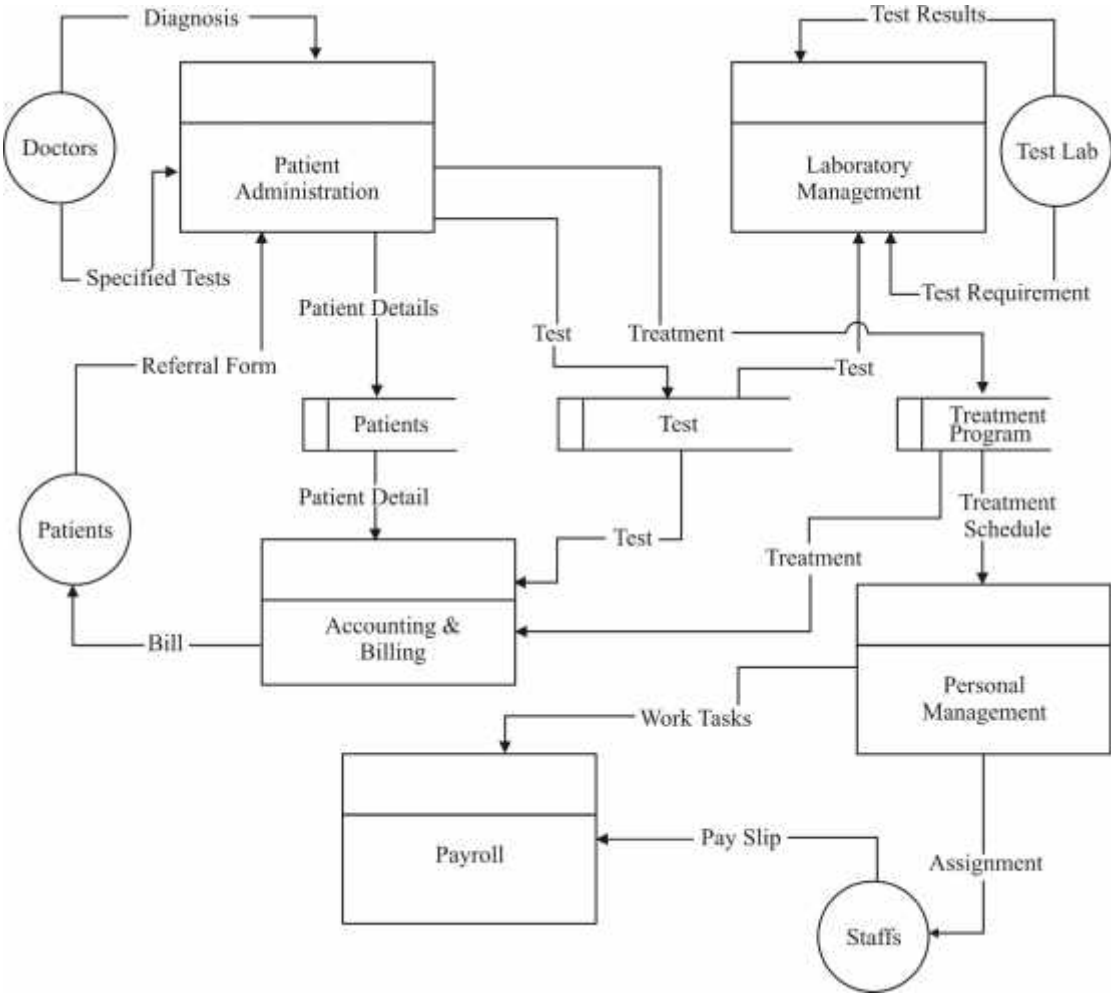

Fig. 4.2: Data Flow Diagram of Hospital

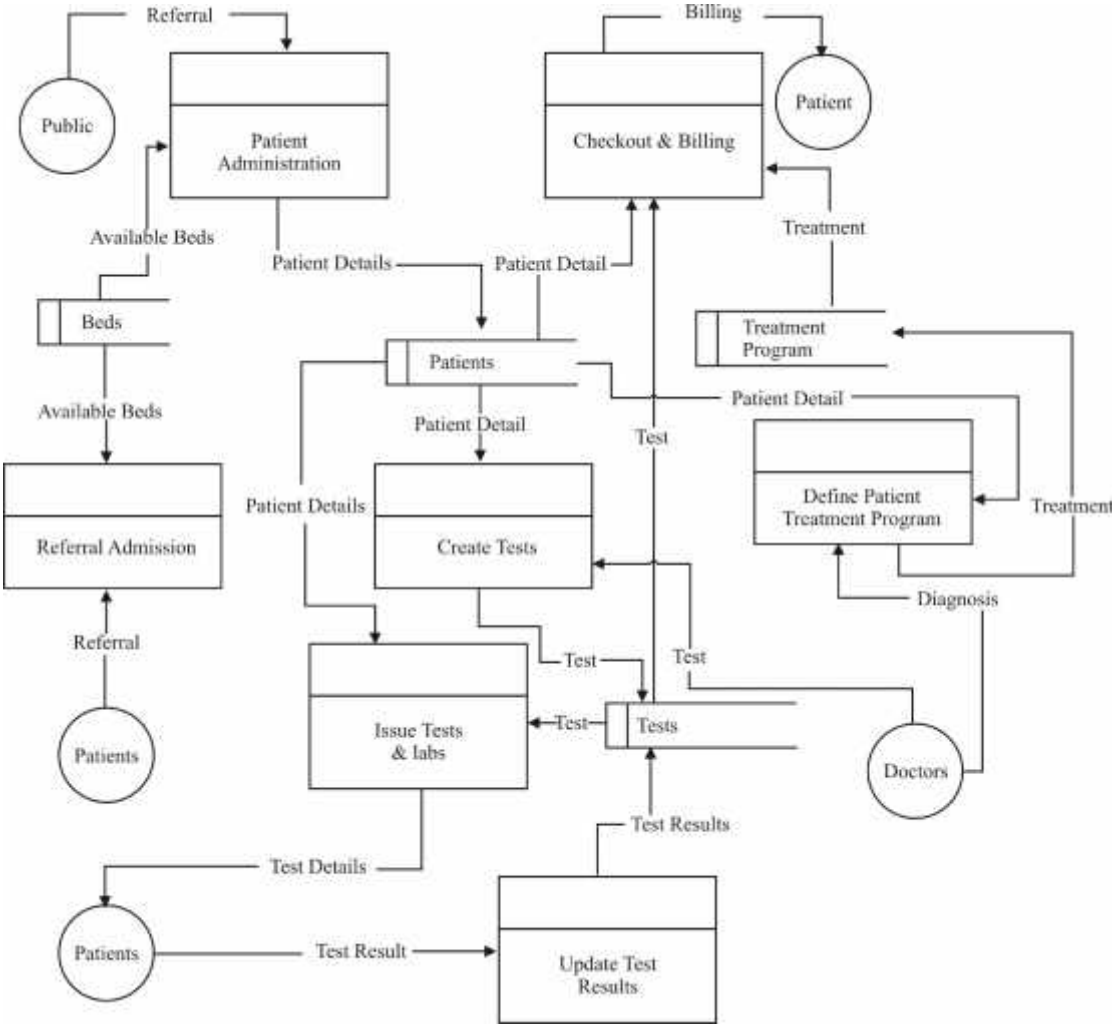

Fig.4.3: Data Flow Diagram of Patient Admission System

4.9 Entity Relationship Diagram

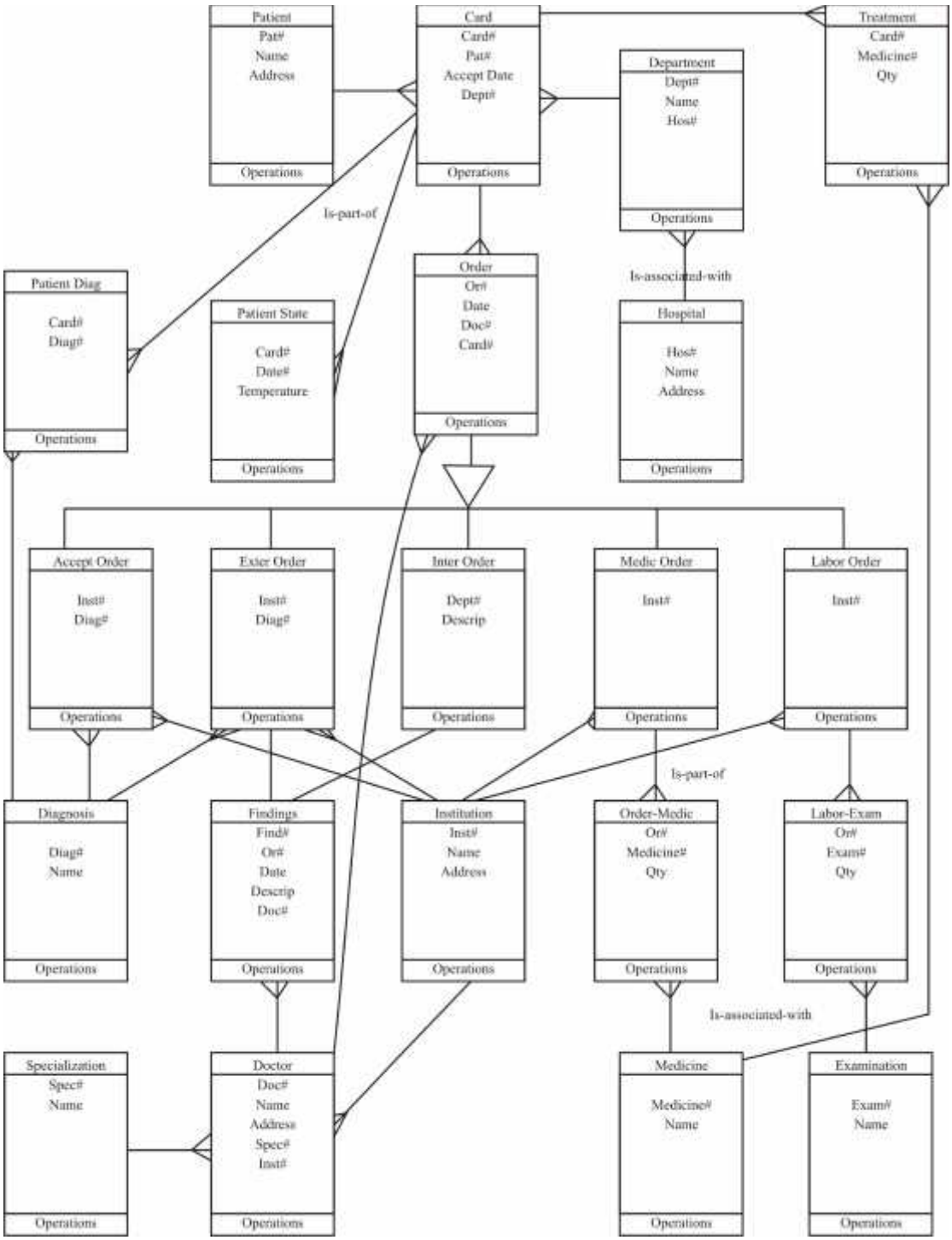

Fig.4.4: Entity Relationship Diagram

4.9 Analysis of Existing System

4.9.1 Existing key Work Process

Key work processes from a patient's perspective are identified first as shown in ***table 4.1.*** These key process are used for evaluation and creation of a Process Profile diagram on the work process as in ***Annex I (Customer-Supplier Relationship Model)*** which is mentioned in the sections below. Thus, it documents the current state of a work process.

Key Work Process
Provide and Manage Inpatient Care
Admit/Place Inpatients (Direct/Prescheduled) Prescheduled)
Admit/Place ED Inpatients
Discharge Patients
Manage Inpatient Care: Medical/Surgical Care
Manage Inpatient Care: Intensive/Critical Care
Manage Inpatient Care: Perinatal/Obstetrical Care
Manage Inpatient Care: Psychiatric Care
Manage Inpatient Care: Rehabilitation/SNF Care
Manage Patient Medical Information
Provide and Manage Standards for Care
Provide Diagnostic Support (e.g., X-ray) lab)
Provide Hotel Services
Provide Inpatient Scheduling
Provide Surgical Support
Provide Therapeutic Support (e.g., drug/RX) respiratory)
Provide and Manage Ambulatory Care
Provide Home Health Care
Provide Same Day Noninvasive Diagnostic Services
Provide Outpatient Rehabilitative/Therapeutic Care
Provide and Manage Clinic Care
Provide Same Day Surgery Procedure Services
Provide and Manage Emergency/Urgent Care

Manage Customer Complaints
Manage Patient Complaints
Manage Physician Complaints
Improve Revenue Cycle Processes
Provide Community Health Services/Education
Provide Information on Service Availability and Cost
Provide Support Processes
Evaluate and Improve Performance
Ensure Compliance with Regulatory requirements
Manage Risk and Safety
Manage Human Resources
Manage Information Systems
Obtain and Manage Supplies/Facilities/Equipment
Plan the Future

Table 4.1: Typical List of Hospital Key Processes From a Patient's Perspective

4.9.2 A Hospital's Inpatient Process Organizational Flow Chart

By analyzing key work processes, the hospital's inpatient process flow is traced as shown in the following diagram.

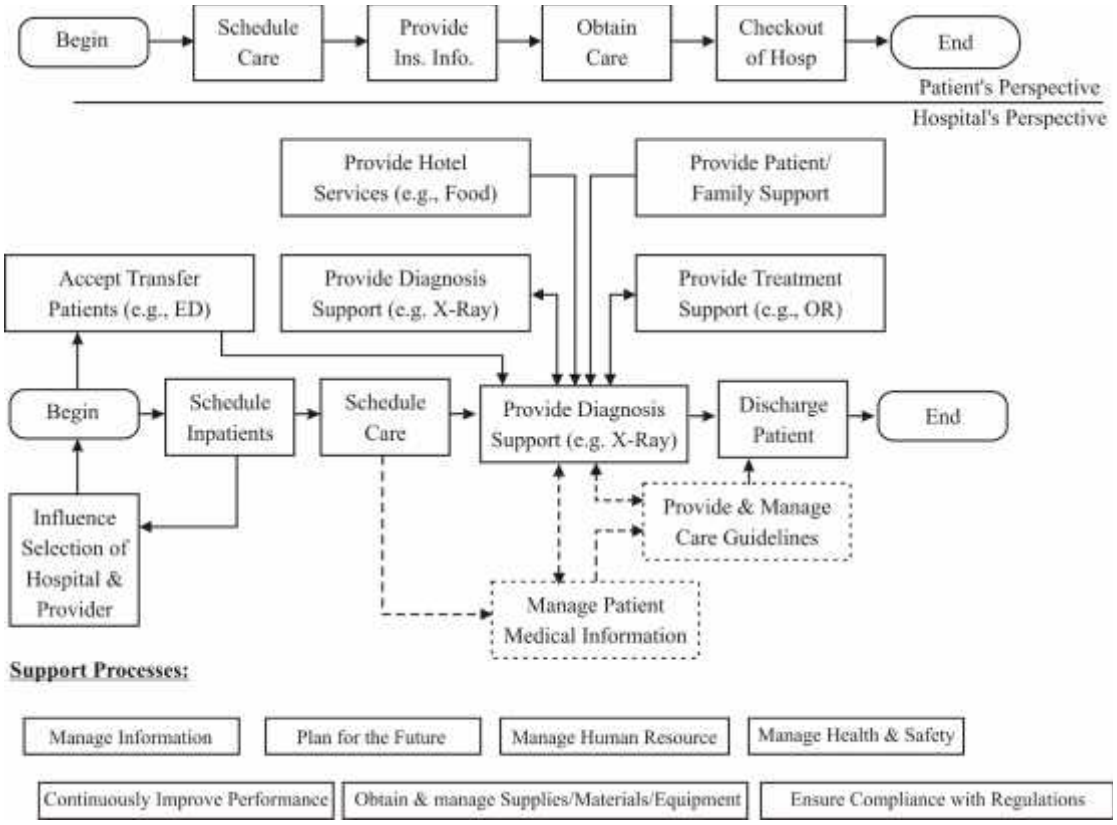

Fig. 4.5: A Hospital's Inpatient Process Organizational Flow Chart

However, there are no specific systems or procedures or techniques are implemented in the NMC, Teaching Hospital, I am recommending the NMC, Teaching Hospital with the Quality Improvement Plan which are detailed in the following sections.

4.10 Identifying Key Processes

To retain a consultant experienced in process management, a systematic approach to QI developed in industry should be decided. This approach assumes that processes, not people, are the problem. Process management is an objective method logy that focuses on the actual work that gets done in an organization, breaking down each process into specific activities that can be analyzed and measured.

The approach should be a game plan rather than a playbook. The "plays" of QI are fairly familiar; Statistical Process Control methods and Pareto diagrams are examples. But winning the quality game requires a game plan that fits the plays into an overall strategy.

The first task of QI is to determine which processes would help to achieve the hospital's overall goal of high quality patient care. Since the patient is the ultimate judge of quality, this involved viewing the hospital's processes from a patient's point of view. Putting ourselves in the patient's shoes, we should mentally tour the clinic, identifying each process encountered. When a patient calls to make an appointment, for example, he or she encounters the process "Schedule Patient."

Those processes affecting the patient's perception of quality, central to long-term success should be identified. Theses should be the *key processes.*

Once this key process is identified, a flow chart of their interrelationships is created. A support process is added, those that maintain the processes directly related to patient care.

(Figure 4.6)

For each box on the chart, a process improvement team is to be appointed from the executive quality council or management. The entire organization is represented on the flow chart in terms of its processes, so we can see how they fit in. the chart serves as both an organization-wide plan and a management tool for administering it.

4.16 Selecting a Process to Improve, Obtaining Commitment and Assigning Ownership

We couldn't, of course, improve all of the processes at once; they should be prioritized. Some of the processes we know may be working well; others we know may have problems, such as the Scheduling Patient process. This process should be chorused early on as one to improve, chiefly because it is an "upstream" process. Errors in an "upstream" process become repeated in subsequent processes for a costly cascading effect.

The Schedule Patients process should be considered so important, the MD and its physician executive director should agree to lead its improvement effort as process co-owners. Assigning ownership to a process builds in accountability and ensures the commitment of top management. Other members of the schedule patient process

improvement team should be the medical director, the clinical area manager, four other physicians, two other administrators, a receptionist and a facilitator.

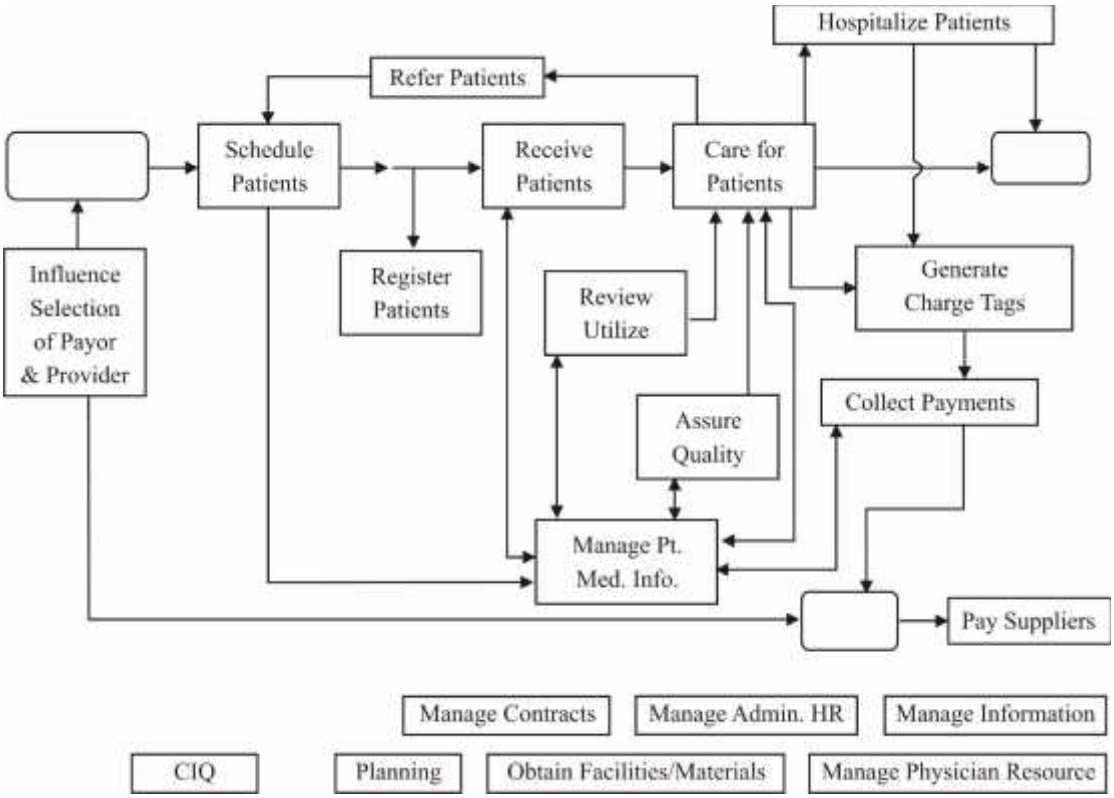

Fig. 4.6: Key Process Chart

The importance of a facilitator is worth mentioning. The facilitator does not need to come from outside the organization, but he or she should be trained and without a vested interest in the issues under discussion. The director of quality management should act as first facilitators, and, they should train other managers to facilitate improvement teams outside the organizational jurisdiction.

4.17 Creating the Customer/Supplier Relationship Diagram

The first step in improving any process involves identifying the "customers" of the process and the outputs they require from "suppliers." The Schedule Patients process, customers and their required outputs are identified as shown in ***Figure 4.8.***

The physician is a supplier of skills and resources to the process, not a customer. An exception is a physician who referred a patient to another physician. In this instance, the referring physician is deemed a customer.

Next the measures used by the process's customers to evaluate quality are identified. Quality measures usually fall into one of two categories: cycle time-the time it takes customers to receive what they requested; and adverse indicators-defects or the customer's negative experiences.

The main cycle time measures are:

- The amount of time spent making the appointment;
- Access time, the time between the making of the appointment and being seen by the physician; and
- The time between the scheduled appointment hour and when the physician actually sees the patient.

The adverse indicators for the process should include:

- The number of failed attempts to make an appointment;
- The number of complaints;
- The number of patient "no-shows;
- The number of errors in recording patient information; and
- The number of patients double-booked at the last minute because the schedule is full.

Once the quality measures are identified, the inputs needed by the schedule patient process are brainstormed and agreed that the most important input is dependable physician availability to patients. If a physician is seeing too many patients, cycle times are too long. The medical skill mix available has a similar impact. Other factors are available space, equipment and hours of operation.

The customer/supplier relationship diagram **Annnex 1** summarizes the customer and supplier inputs, the process outputs and the quality measures used to evaluate the process.

Developing the customer/supplier diagram has several beneficial results. For one thing, staff change the way they thought about their jobs. They look at the process objectively, in terms of its activities, and gain an understanding of how their jobs fit into the hospital's overall operations. They also realize that they are working for the patient, not the physician. By taking the patient's viewpoint, the appropriate activities are focused to improve. The diagram also clarifies the responsibility and accountability for the specific activities of the process and established the parameters for analyzing and collecting data.

4.18 Identifying What to Improve

To decide what needed improvement, a flow chart of the schedule patient process is created by showing the activities and relationships. Looking at the process in this new way reveals dozens of opportunities for improvements. Next the feedback measures, cycle times and defects measures are reviewed that generate even more ideas for ways to improve. It is not always necessary for the entire process to work on an improvement either; individuals or small sub-teams could be assigned the task. The more significant projects, however, needs to be explored in more detail.

For example, patient "no shows" determination is a significant adverse indicator. The reasons why a patient might fail to show up for an appointment are charted on a cause-and-effect diagram. The cause-and-effect diagram then served as a guide in developing a series of open-ended questions for a telephone survey of no-show patients, and the answers to the questions are tallied and graphed on a pareto diagram.

As ***Figure 4.8*** shows, the most common reason for no-shows is that the patient forgot about the appointment. To address this problem three different reminder systems are designed and measured the results of each to determine which will work best. Other causes will be addressed as the work progresses.

4.19 Developing a Review Process

To evaluate improvements and goals, a review for each key process is set up. Objective feedback measures that include a storyboard display of improvement data (how much cycle times have been reduced, how many complaints have been received, and so on), are adopted by a multi-level rating scheme to monitor and evaluate progress. Each rating level has specific requirements that must be met before a process advances to the next highest rating.

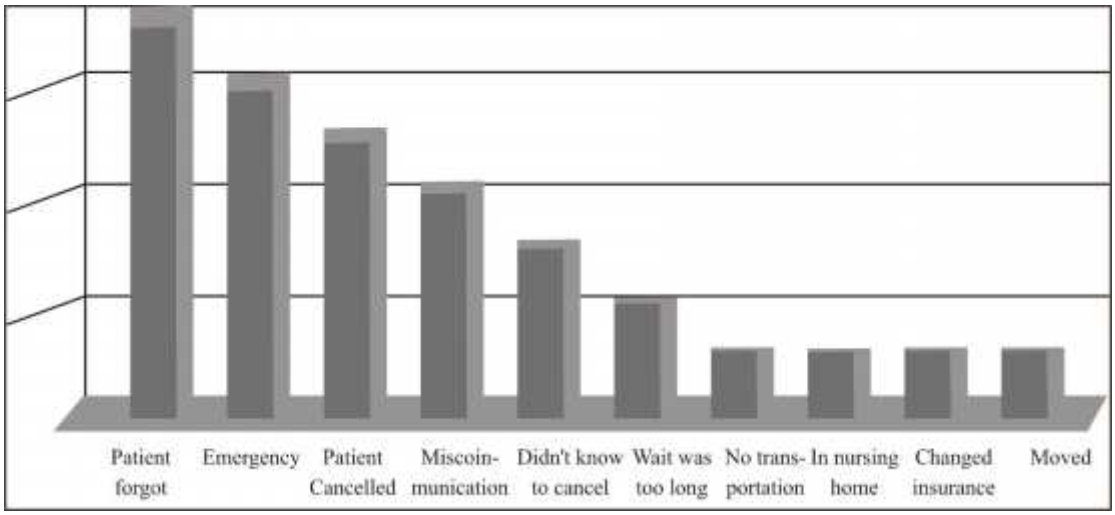

Fig 4.7: Pareto Diagram

In addition to establish objective measurements of a process's improvement, the review process provides an opportunity to recognize the contributions of efforts, boosting morale and team spirit. The review process is also a chance to gain executive buy-in for any potentially controversial improvements.

4.20 The Initiation of a Quality Improvement Process

A professional, systematic approach to quality improvement (QI) which should subsequently undertake a drive for Total Quality Improvement (TOI) that incorporates and expands the ideas presented by the experts. Unlike any other manufacturing organizations, health care is not faced with a major competitive threat. The primary motivation for adopting TOI in health care is the belief that it will reduce expenses by ten to thirty-five percent or more. By practicing QI hospitals expect to

become more efficient and thus remain a part of the industry they have led for so long.

As the organization is struggling to become a provider of managed care which meant they have to lower their internal costs substantially. Consequently, they seem to like an ideal candidate for initiating quality improvement activities. The medical and management staff should be introduced to the concepts of QI. Once oriented, they readily agreed to begin a pilot QT effort.

4.16 Quality Improvement Plans

Quality improvement plans specifies how and by whom the changes will be implemented.

The simple nine step plan and quality improvement team is designed as shown in ***Figure 4.10.*** Before recounting the experience that a decision is made at the outset to provide "just in time" training for the team members is noted. That decision should took advantage of the fact that the team would be led during its early stages by a seasoned meeting facilitator who also is expert in quality improvement techniques.

If the group encountered a situation that it is not trained to handle, it is the facilitator's duty to train them personally (or arrange for their training) during a regularly scheduled team meeting. This approach can be expensive but maximizes the probability of retaining the training material and gaining mastery of the techniques.

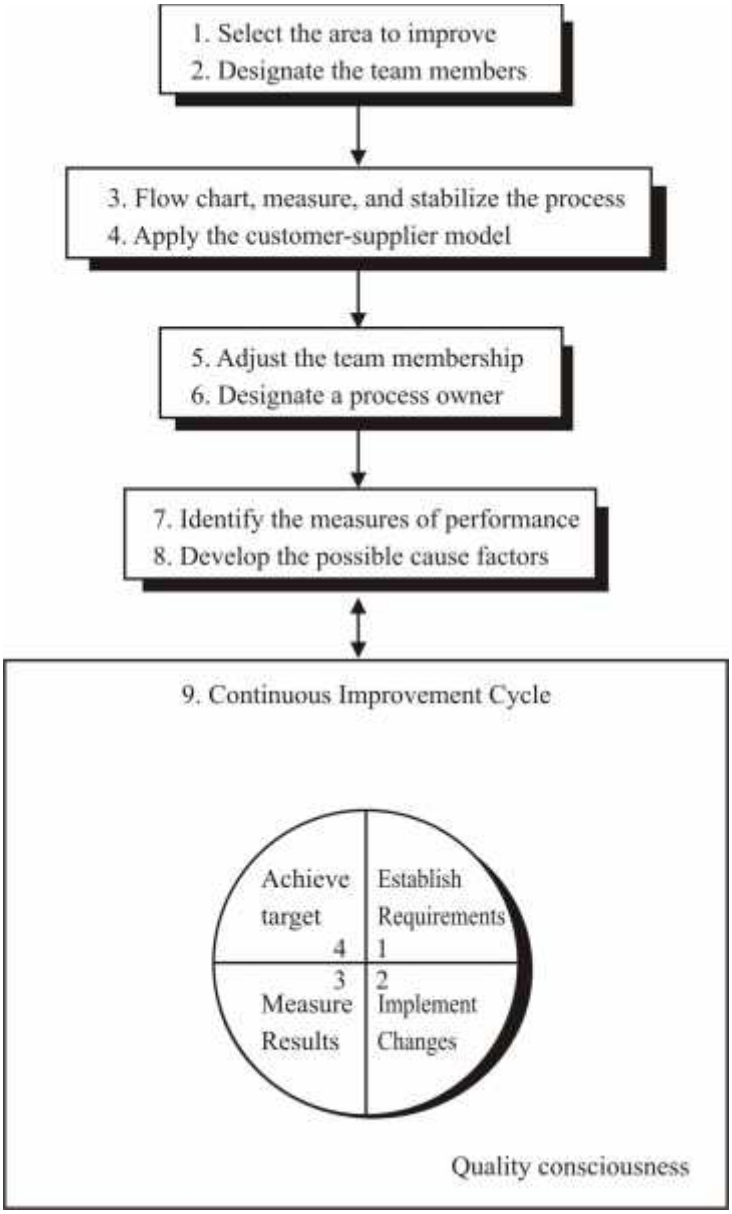

Fig. 4.8: QIT Plan for Improving a Process

The QIT activities are:

4.16.2 Select the Area to Improve

To ensure success, an organization should normally target a "safe" (easy) process for its pilot QI effort. But it is critical to improve the medical records process quickly. The retrieval and management of patient medical records is particularly troublesome to the specialist doctors. Without a patient's medical record, specialist

clinical care could not always be rendered reliably. If care is given without access to the patient's medical record, the doctor increased the risk of malpractice.

Management should take some spot measurements that led them to believe that the care of as many as eighty patients per day is affected by this situation.

If OI methods could be employed successfully to improve a process that is so visible to the doctors, then acceptance of QI as the vehicle for dealing with other defective processes in the organization would undoubtedly follow.

4.16.2 Designate the Team members

The medical records process spanned several functional organizations (e.g., lab, x-ray, the branches, nursing, administration, courier, the hospital, etc.) and thus presented a particularly difficult challenge regarding who should be on the QIT. Rather than attempt to address all the membership issues at once, the initial team membership should be decided upon during a QI orientation presentation to personnel in the main medical records filing function. The personnel are so empowered by the idea that management should involve them in decisions about their work that the most respected among them are immediately nominated to be QIT members. Realizing that step five in the QIT plan should call for adjusting team membership, management feel comfortable launching the QIT with only the personnel drawn from the medical records functional group.

During this orientation meeting, a group discussion ensue which resulted in the formal QIT objective being defined as "Develop and implement the changes necessary to ensure that no patient is seen without a medical record."

Since the team membership is composed of both managers and non-managers, the first team meeting focused on development of rules for how the members would interact with each other. They should unanimously agree on the meeting rules shown in the inset.

Meeting Rules

- No Rank, Each should treat as a Peer
- One Conversation, No Side Conversations
- No Criticism, ask Only Clarifying Questions
- All Ideas should be recorded so all can see

4.16.3 Flow Chart, Measure, and Stabilize the Process

The team members should be asked to get together before the first meeting and flow chart the existing process for retrieving and filling medical records. That flow chart is the subject of the initial meeting. And, since no one person (not even the manager) knows all the steps involved in handling some chart situations, a lively discussion occurred. After several meetings, they should eventually agree upon the flow chart shown in ***Figure 4.9.*** This step produces many ideas about possible actions to take and they are recorded by the team recorder for possible use later.

Next, it is necessary to measure the overall process. However, that isn't readily possible since not everyone involve in the process is represented on the team (e.g., nursing).

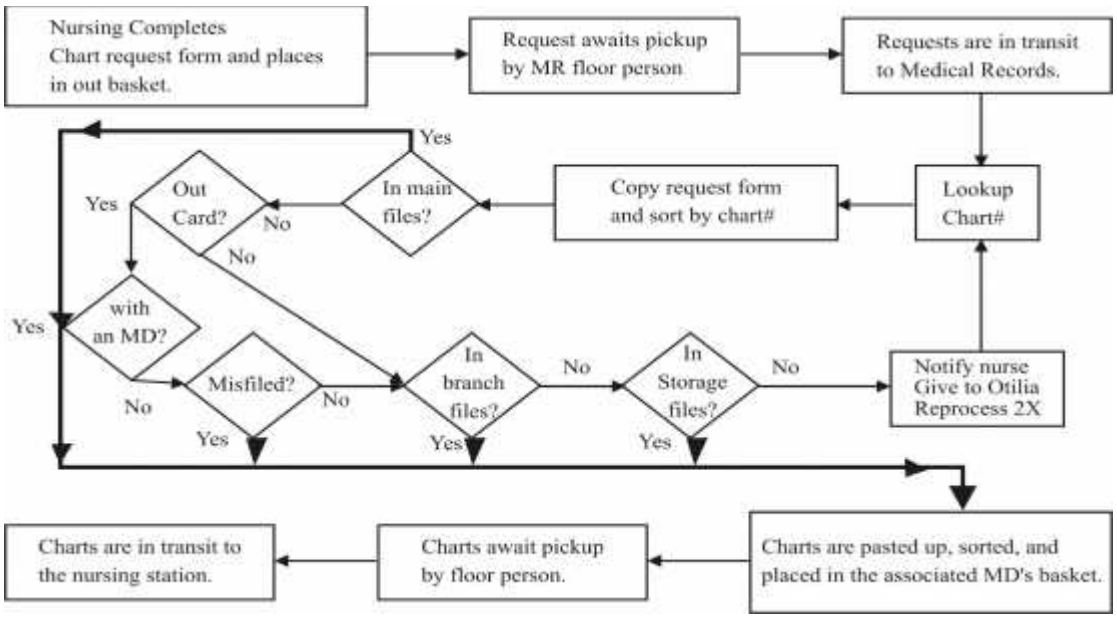

Fig 4.9: Medical Record Flow Chart

Nonetheless, a group consensus exists that identified the retrieval of records from the various branches as the most severe problem. And, since the data for five of the eight branches could be done without involving others, its collection should be immediately initiated.

The measurement should consist of recording the daily volume of charts requested from the branches as well as the number actually received. Any not received are counted as "defects."

For example, the defect data for the first seven weeks is as shown in the ***Figure 4.11.*** The upper control limit (UCL) of twelve is computed by assuming a poisson data distribution. (As a check, an alternative computation that yielded a UCL of thirteen is made by assuming a normal distribution existed after the outliers are discarded.) the two peaks (outliers) of eighteen and thirteen are investgated and confirmed to be due to the same special variation: the employees who process the requests in a given branch are not available (e.g., due to vacation, illness, etc.) to do the work on either of those days.

Branch Chart Retrieval Failures

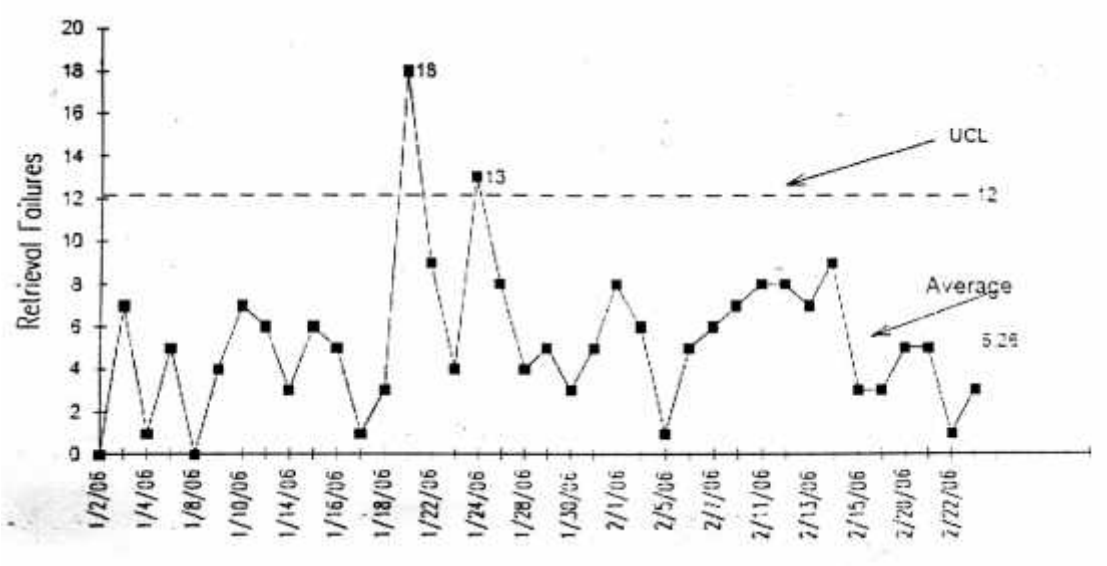

Fig. 4.10: Initial Process Measurement

In an attempt to see if there is a correlation between the number of charts requested and the number of defects, a scatter diagram is plotted (***Figure 4.11).*** Its horizontal nature shows there is no correlation. This is confirmed visually by plotting the same data on the y-axis versus time on the x-axis (***Figure 4.12).*** Instution says that if the defect count correlates to the workload (requests), then the defects should increase on days of high requests. The lack of correlation is confirmed by noting that the defect peak of eighteen coincided with a request low point of 115 !

There is speculation among some QIT members that the defects might correlate with the patient work load in the branch office that failed to forward the requested chart. That is noted for later follow-up.

Chart Requests Vs. Defects Scatter Diagram

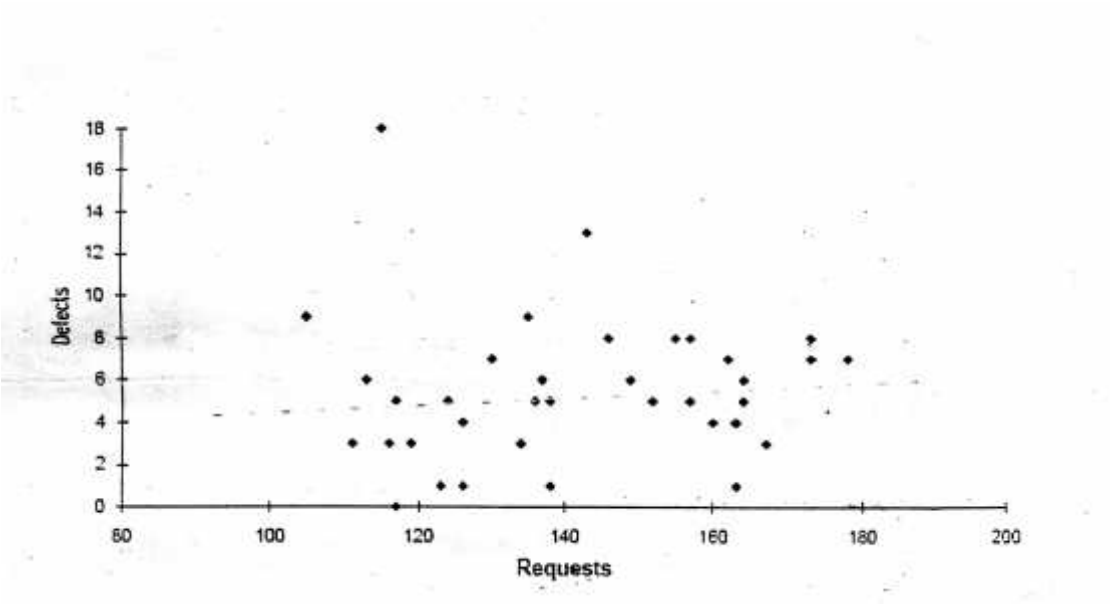

Fig. 4.11: Scatter Diagram-Branch

Branch Chart Retrieval Failures

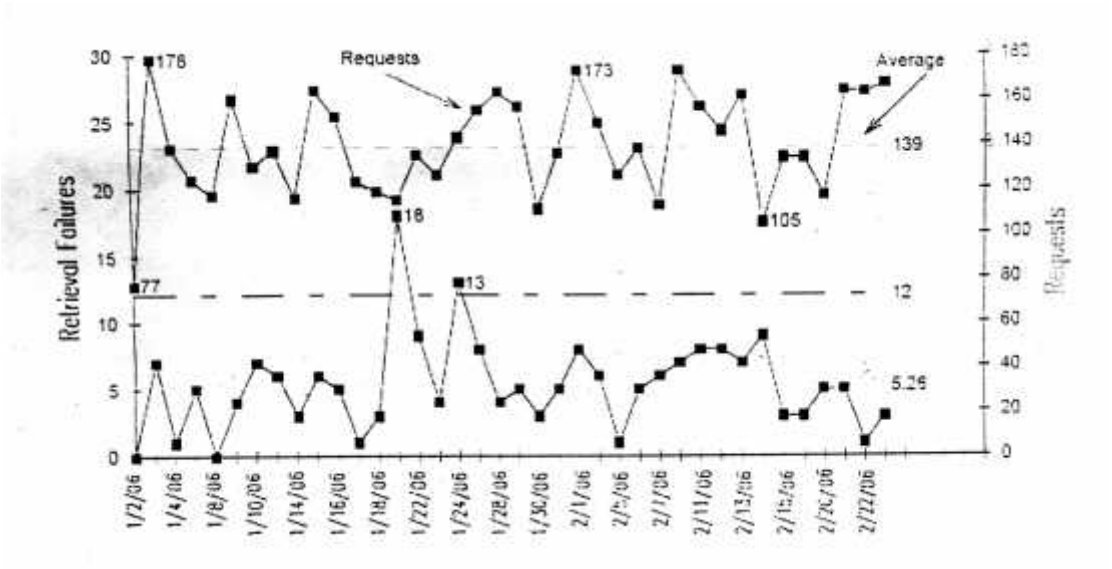

Fig. 4.12: Plot of Chart Requests and Defects on the Same Graph

4.16.4 Apply the Customer-Supplier Relationship Model

At this point the group should identify the inputs and outputs the process along with the responsible party. Although it might seem obvious that the branches are suppliers, it is not so obvious that nursing is the customer. This idea requires a mind-set change by some medical records department should comprise the team. But now additional information has to be developed about who shall participate. For instance, it is suggested that the "customer" (nursing) be on the team as should the "supplier" (branch clinics). In addition, since there is more work than one team could handle, it is decided to split the team into two groups: one (the Branch team) to work on the branch related issues, and one (the Appointments team) to work on items related to the rest of the process. To coordinate the two efforts, two medical records personnel (one supervisor and one clerk) are assigned membership on both teams. The Branch team is expanded to include three of the eight branch managers. The appointments team is expanded to include two nurses and, later in the projects, two doctors.

To fit the schedules of the nurse and doctor team members, the appointments team meeting time is set for Wednesdays from noon to 1:30 p.m. This, combined with the fact that there is the possibility of being assigned tasks by the team, might have dampened the desire to participate. That, however, is not true. The potential dampening is offset by the empowerment that the team members felt when asked to

participate in solving a personally frustrating problem that has plagued the organization for years and that involves decision making about how their work is done.

4.18.6 Designate a Process Owner

It is functionally organization but the medical records retrieval process is cross functional. Nonetheless, one person I assigned as the branch process and another as the "owner" for the Appointments process. The assignment, however, is not declared by fiat. Instead, participative management techniques should employ to ensure maximum buy-in by all team members. The position of process owner carries matrix management powers with it but did not have the clout that goes with being a functional manager. Therefore, cooperation of all concerned is important if the person selected is to have the best chance for succeeding.

4.18.7 Identify the Measures of Performance

The initial measurements taken in step three has focused on the number of branch charts requested and the number received. The number not received (defects) is then calculated as the difference. This data is also accumulated for a few weeks for the appointments process. Nursing is asked to gather the appointments data so the team would have a "customer" perspective. However, this approach is soon dropped in favor of only counting the defects (charts that aren't received by nursing by the time needed). This latter approach is much simpler since a "chart request" document existed for every chart ordered by nursing. Both nursing and medical records personnel should keep the counts and they should be reconciled daily.

4.18.8 Identify the Possible Cause Factors

The QITs should use a cause-and-effect diagram (***Figure 4.11)*** to brainstorm the possible reasons for not being able to retrieve a chart. This information should be used to design a Branch check sheet (***Table 4.2***). Room is left on the check sheet to write in additional reasons as they are encountered. Each time a defect occurred, a copy of the related chart request form should be made and a notation made regarding the reason the chart has not been retrieved. This information should be tallied daily

using the check sheet. The data for the most recent period (usually two weeks) is then tabulated and plotted on a Pareto diagram (***Figure 4.14***)

A similar check sheet (not shown) should be developed for the Appointments process with the exception that specialist doctor names are used instead of branch clinic locations. Information for a two week period should be compiled in a pareto diagram ***(Figure 4.14***)

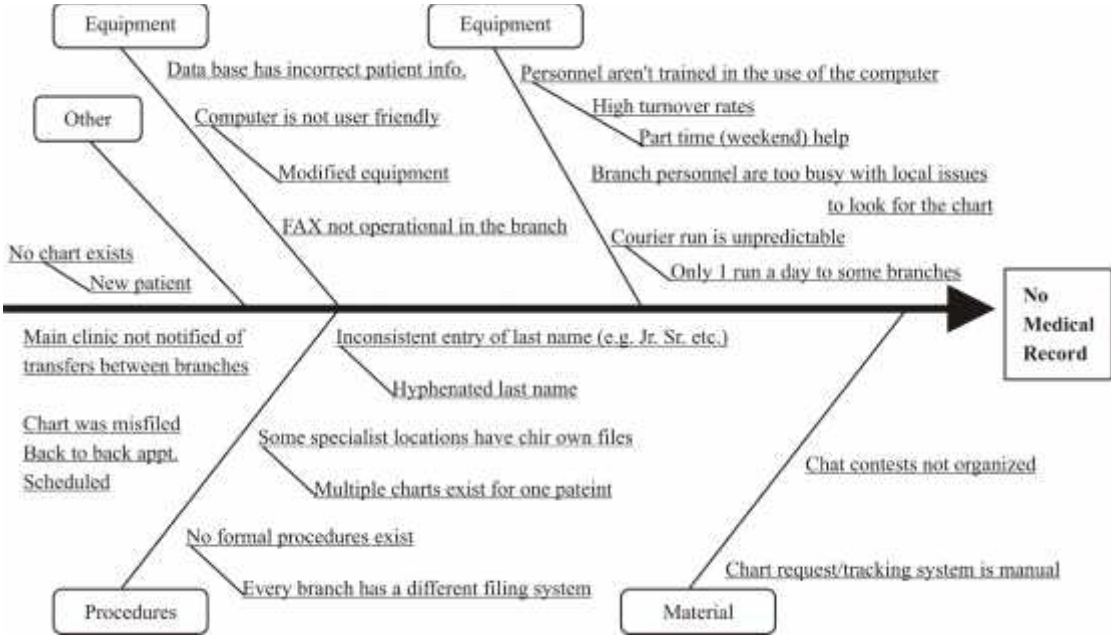

Fig.4.13: Cause and Effect Diagram

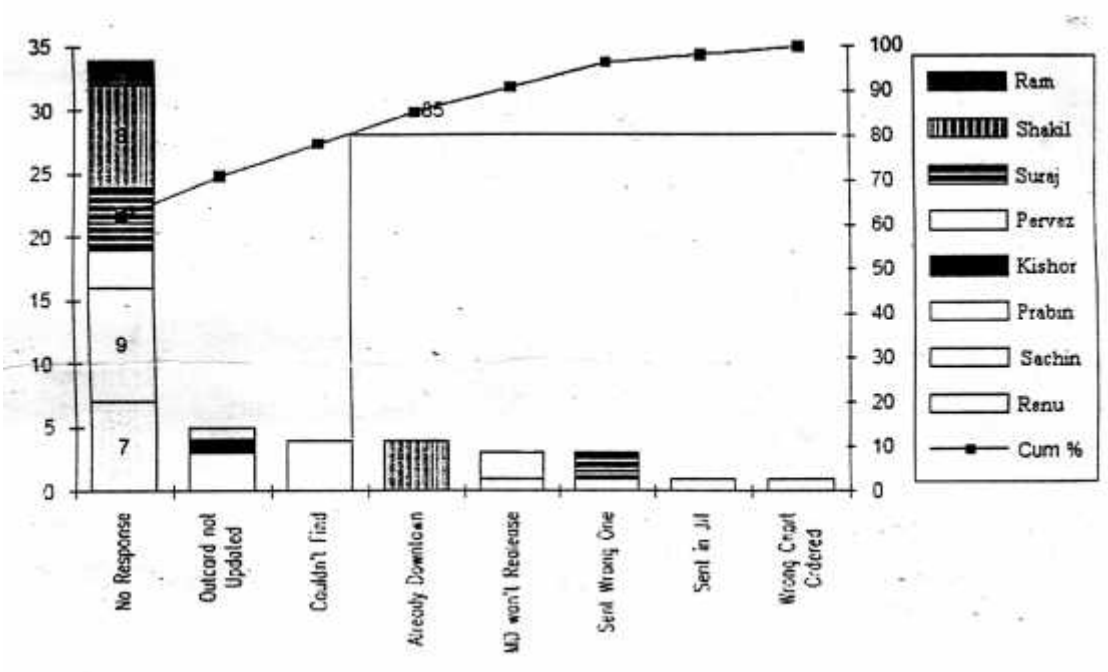

Fig.4.14: Pareto Diagram-Branch Team

(Attach a detailed explanation for each chart if not found today)

Date:

						First Care			
Reason	Ram	Shakil	Suraj	Pervez	Kishor	Prabin	Sachin	Renu	Total
No Response									
Could not find									
MD wouldn't Release									
Sent Wrong One									
Alreadly Downtime									
Outcard									
Not updated									
Ordered Wrong									
Sent Back Just in Time									
Total									

Table 4.2: Daily Check Sheet

4.18.9 Continuous Improvement Cycle

After 10 weeks of QIT activity, the process should be determined to be stable so it is decided to initiate the first repeated cycles of improvement.

4.18.9.1 Establish Requirements

The cost of defects (rework in this case) is estimated to exceed Rs. 50,000 annually (i.e., more than one full time employee). This estimate is based on the fact that when a chart does not arrive as requested, nursing time is expended on the phone with the appropriate branch arranging for elements of the chart to be sent via FAX to the main clinic.

As it reveals that the medical records personnel often would detect the pending defect situation and, in an attempt to avoid it, would repeat the process of requesting the chart. These follow-up chart requests, even though they are handled via telephone, usually met with failure as well. The large volume of charts requiring this special handling made the total cost quite high.

As informal discussions with medical records employees reveals chart retrieval work to be so frustrating that they would occasionally take a "sick" day rather than come into work. The estimated cost of defects does not include this cost of employee absence. Nor does it include any cost associated with employee turnover even though management may feels more than one employee has left because of the frustrating work environment. Neither does it quantity the cost associated with having to reschedule patients rather than administer care without the chart. (This latter situation had the potential to become lost revenue entirely.) Nor does the cost of defects include the fact that the frustration of working in a defective process lowered the self-esteem of the medical records personnel and, therefore, productivity is not what it should be. Neither is it possible to quantify accurately the cost associated with the expenditure of doctor and management time to deal with complaints by irate doctors. (One doctor who recently left the organization cited the inability to consistently obtain medical records as a factor influencing his departure.) When these additional factors are considered the cost of defects could easily exceed Rs. 75,000 annually. And to that must be added a cost associated with the risk of malpractice.

For Example: The pareto diagram for Appointments (***Figure 4.15***) reveals that more than forty percent of the overall failures are due to failures in the branch sub process. And the previous Pareto diagram for Branch failures (***Figure 4.14***) reveals that about sixty percent of the branch failures are attributed to the branch just not

responding to a request for a chart ("no response"). This is concluded to be a procedural and training issue. Once corrected, the general situation is expected to improve by more than twenty-five percent. Therefore, it is decided that the first cycle of continuous improvement should focus on elimination the "no response" condition entirely.

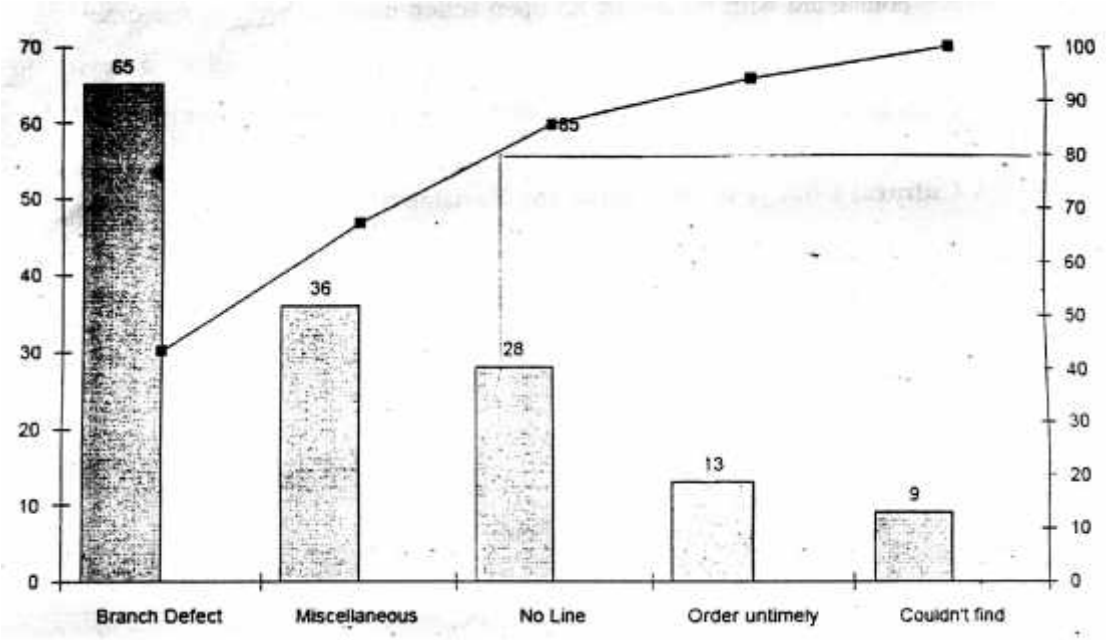

Fig.4.15: Pareto Diagram-Appointments

4.18.9.2 Implement Changes

The team should decide the primary change needed is increased awareness about the importance of forwarding a chart immediately upon request. The first step in increasing awareness is to invite more branch managers to join the team. In addition, it is decided that the data that is being collected would be published monthly to provide feedback to each branch about how well it is doing. Additi0onal steps included half day working visits to each branch by medical records personnel. Branch personnel should reciprocate by visiting the main facility and viewing the operations there.

The team should also target the lack of formalized procedures and began to develop and implement those as time permitted. The procedure for the Branch process

included the requirement that the clinic operations officer be notified immediately upon the occurrence of a "no response" condition by a branch. It is the duty of the operations officer to then personally contact the responsible branch manager for an explanation.

The detailed list of action items that had been initiated in step three began to grow quite rapidly. It now included action due dates and the name (s) of the person responsible for achieving them. The weekly meetings often became consumed with reviewing all open action items as well as the ones completed since the last meeting. Any remaining time is devoted to a review of the weekly performance data and brainstorming and new action items.

4.19 A Cultural Change to Overcome any Resistance to Change

Improving processes may require and inspire a culture change in the organization which also overcomes with the resistance in the new processes. Congenital wisdom may have to give way to new concepts so that ideal solution of Quality Improvement System can be implemented.

Conventional Wisdom	New Concept
Quality is meeting conformance standards. Or Quality is an intangible good.	Quality is meeting and exceeding customer expectations. Quality is defined by the customer
Finding and fixing problems results in improvements, which may or may not be sustainable.	Making changes to the system to prevent problems results in sustainable improvements.
Effectiveness and efficiency is achieved by meeting acceptable defect levels.	Effectiveness and efficiency is achieved by continuously improving.
Crisis management is the dominant management mode.	Preventative management is the dominant management mode.
Performance standards and quotas improve productivity.	Changes in the process improve productivity.
Defects are caused by workers.	Defects are caused by flaws in the process, and management is responsible for the process.

Decisions are made by "superiors."	Decisions are made through collaboration between staff and management.
Top management evaluates the organization on financial performance alone.	Top management focuses on process performance and customer satisfaction, as well as financial performance.
Process improvement is expensive.	Process improvement leads to lower costs.
Only managers are capable of identifying and making improvements.	Workers know the process best and will suggest excellent ways to improve it when given a chance.
Managers command functional and are concerned with directing and controlling.	Team leaders guide cross-functional improvement teams and are concerned with planning and prevention.
Employees receive instructions and information from above, as deemed appropriate by management.	Management shares information with employees on a routine basis and on request.
Leadership for an improvement effort can be delegated to outside experts.	Leadership for an improvement effort is provided by executives within the organization, who are accountable for results.
Reviews are only necessary when things go wrong.	Regular, disciplined reviews are a key to improved process.

Table 4.3: A Cultural Change: Conventional Vs New Concept

4.20 Major finding of the Existing System

However existing MIS system is working well, it should be used for upgrading its quality and performance.

a) Hospital Management System is one of the complex systems due to its nature of service and wide area of activities and experts involved.

b) MIS department has neither focused nor implemented any Quality Improvement Techniques.

c) Quality Improvement has been taken separately from MIS department.

d) Reviews are only performed when there goes something wrong.

e) There is no mechanism to measure quality and its improvement.'

f) None of the staffs of the college knows that QI software tools are available due to lack of expertism.

g) The information system is based on Traditional paper-based information and manual filing system except computerized patient registration system.

h) Information does not flow systematically due to absence of Network-based computerized information system to coordinate and communicate with different department.

i) Traditional paper-based information system creates delay in making decisions.

j) It is difficult to implement MIS due to lack of necessary infrastructure.

- Lack of equipment & accessories
- Lack of technical manpower
- Lack of IT experts
- Budget planning

k) The computer is used mainly for:

- Word-processing
- Spreadsheet
- Data storing and retrieving

l) Most of the computer have problem of power failure and diskette problem and losing data. The other type of major problems is reliable maintenance and repair services.

m) Mostly, difficulties with the present system have occurred not only because of inadequately-trained manpower but also because of inadequate computer capacity and facilities.

n) The employees do not find a favorable atmosphere for the utilization of their knowledge and skills. Training is not properly utilized for achieving goals of the organization.

o) No study has been conducted for the future planning of manpower and technology. The corporation does not have a system of forecast of its manpower needs and their type so as to foresee with the projected supply in accordance with its expansion service.

4.23 Limitations of Existing System

However, existing MIS department is serving its best to perform; it has many limitations which are discussed as follows:

a) The MIS is only used for data storing and retrieval mechanism.

b) The traditional way of information system is maintained.

c) There are limited number of MIS staffs.

d) MIS is not used to fully strengthen its capacity.

e) Lack of capable manpower and IT experts to handle sophisticated information technology to maintain proper information system within the department.

f) Lack of proper informational infrastructure to communicate with different departments.

g) MIS is not used for quality improvements system.

h) There is no mechanism to measure the quality improvement system nor there are any software to measure its improvement and impact.

i) The quality of software and hardware is as recommended by its respective vendors only.

CHAPTER-V

SUMMARY, CONCLUSION AND RECOMMENDATION

5.4 Summary

National Medical Collage, Teaching Hospital, Birgunj has a good position among other Medical Colleges in our country. The inflow of patients as well as expansion of college wings is greatly increased form past few years. As healthcare must be more customers focused, it is becoming more market driven. Demonstrating that every one of the activities to be adapted to a customer-inspired quality improvement approach, it made IT teams more effective, more focuses, and more result oriented.

Like many hospitals in our country, the NMC, multi-disciplinary improvement has to be made as a step towards improving quality. As management's days in health care are numbered, medical group administrators can no longer rely on expanding revenues by increasing the client base, adding physicians or tweaking fees. Instead, the major challenge facing health care management today is to do more with less. Given this challenge, Continuous Quality Improvement System (CQIS) is only the answer. So, a new rigor of thinking directs CQI effort, which features objective feedback measures and success indicators that can be benchmarked throughout the industry.

There has been a general shift in IS research away form technological to managerial and organizational issues, hence an increasing interest in the application of quality improvement which primarily focus on academic research should move to a deeper level of analysis, characterized by specific, explanatory models connected to broader general theories. Approaches drawing on appropriate reference disciplines can avoid idiosyncratic private theries of the strategic use of quality improvement methods. The overall result is a contribution to both fields of information systems and quality improvement. Alternatively, frameworks based on private theories lacking this kind of foundation are of more limited value.

So, Quality Improvement System is analyzed and designed to strengthen its service level in this Thesis.

5.5 Conclusion

In developing a quality control plan based on key processes, Organization at developed management system and culture should allow to effectively improve quality-on a continuous basis. A new rigor of thinking directs QI effort, which features objective feedback measures and success indicators that can be benchmarked throughout the industry.

The QI can work for other medical groups too. We have a tremendous industry opportunity to tease out processes for improvement generic to all clinics-patient, Registration, scheduling, charts and many others. Improving key processes is the best way to winning the quality game, and win the quality game is the best way to become a competitive low-cost provider of first-rate health services.

A major problem with past information systems researches the proliferation of frameworks at the expense of explanatory models based on a general theory, and the lack of reference disciplines that can provide appropriate general theories. Much of the current work on the strategic impacts of information technology and its quality improvement, despite dramatic reference to "Quality Improvement" makes little or no use of bodies of theory related to either Quality or Strategy. As the field matures, the primary focus of academic research should have move to a deeper level of analysis. Characterized by specific, explanatory models connected to boarder general theories. Approaches drawing on appropriate reference disciplines can avoid idiosyncratic private theories of the strategic use of information systems for quality improvements. Assertions and conclusions that are plausibly argued form an accepted point of origin are seen as part of the larger fabric of corporate strategy. The overall result is a contribution to both fields of information systems and quality improvement. Alternatively, frameworks based on private theories lacking this kind of foundation are of more limited value.

Hence the MIS based Quality Improvement System for Patient's Record flow System is analyzed and CQI is designed to strengthen its service level.

However, the success of the organization depends on how we use our tools not what we have.

5.6 Recommendations

The demand of medical staffs and services has not been able to provide to the nation. In today's context many private hospitals are in competition with NMC, Teaching Hospital. So, NMC, Teaching Hospital needs to improve in many related department. New technology should be used to give the customer-care service more effectively, efficiently and qualitatively. In order to compete and stand upright in front of other organization, it should give emphasis on the following conditions:

- It should provide better qualities to the customers and introduce new methodologies to perform the work effectively and efficiently.
- Properly train and motivate the staffs.
- It should try to stop unnecessary external influence such as political influences
- There should be proper communication between the all the members and staffs so that there will be continuous flow o information
- Software which facilitates data integrity, data redundancy and data sharing should be applied for the betterments of the communication and quality control system.

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Annexes

Annex-1

Cycle time measure(s): Access time, Time required to schedule an appt., actual vs. scheduled appointment time.

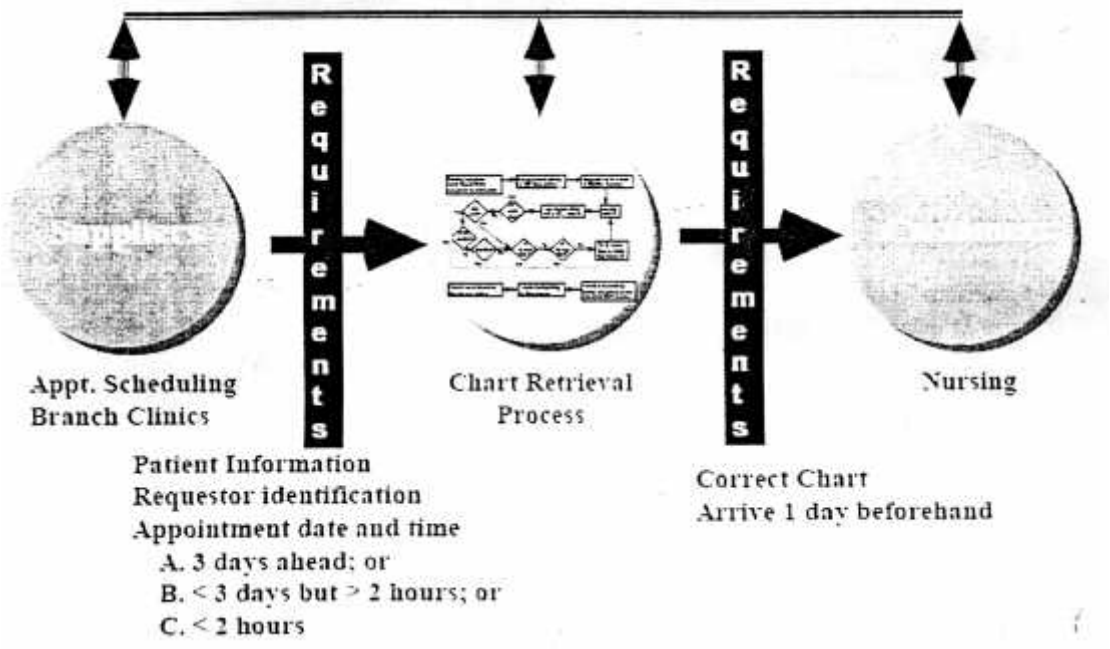
Adverse Indicators: #Patient & referring MD complaints, #No-shows, # incorrect schedule entries, # access failures, # pat. Bumped.

Other Quality Measures: Patient satisfactory level.

Customer-Supplier Relationship Diagram

Annex-2

Feedback: Daily Reconciliation of defect count



Customer Supplier Model

Annex-3

Statistical Data of NMC

(Source NMC annual report 2009

National Medical College & Teaching Hospital Birgunj
Monthly Record of OPD Patients
Baishakh to Poush (2066)

S#	Month	Med	Surg	Ortho	Paed	Gyne	Ent	Dent	Skin	Psy	Total
1	Baishakh	2349	1364	1075	1086	1092	792	814	715	29	9316
2	Jestha	2376	1394	1097	1106	1064	794	861	703	33	9428
3	Ashad	2378	1370	1286	1049	1065	792	829	781	67	9617
4	Shrawan	2381	1468	1263	941	936	733	803	691	70	9286
5	Bhadra	2141	1325	1295	1148	1038	866	807	810	108	9538
6	Ashwin	1435	1247	1062	843	888	758	751	784	87	7855
7	Kartik	1793	1067	1002	587	591	644	517	627	130	6958
8	Mansir	2242	1337	1278	766	766	862	726	752	207	8936
9	Poush	2175	1207	1173	634	608	575	565	619	165	7721
	Total	19270	11779	10531	8160	8048	6816	6673	6482	896	78655

National Medical College & Teaching Hospital Birgunj
Record of Male & Female
Baishakh to Poush (2066)

S#	Month	Male	Female	Total	Remarks
1	Baishakh	4762	4554	9316	
2	Jestha	4784	4644	9428	
3	Ashad	4964	4653	9617	
4	Shrawan	4956	4330	9286	
5	Bhadra	5247	4291	9538	
6	Ashwin	4471	3384	7855	
7	Kartik	3793	3165	6958	
8	Mansir	4673	4263	6936	
9	Poush	4134	3587	7721	
	Total	41784	36871	78655	

National Medical College & Teaching Hospital Birgunj
Monthly Record of OPD Patients at Parsauni Birta
Baishakh to Poush (2066)

S#	Month	No of Patients	Remarks
1	Baishakh	641	
2	Jestha	705	
3	Ashad	732	
4	Shrawan	762	
5	Bhadra	850	
6	Ashiwin	535	
7	Kartik	804	
8	Mansir	962	
9	Poush	980	
	Total	6970	

National Medical College & Teaching Hospital Birgunj
Monthly Record X-Ray Cases
Baishakh to Poush (2066)

S#	Month	OPD	Emergency	Total	Remarks
1	Baishakh	1384	334	1718	
2	Jestha	1397	352	1749	
3	Ashad	1421	393	1814	
4	Shrawan	1440	335	1775	
5	Bhadra	1319	231	1550	
6	Ashwin	942	258	1200	
7	Kartik	1119	268	1387	
8	Mansir	1544	216	1760	
9	Poush	1377	227	1604	
	Total	11943	2614	14557	

National Medical College & Teaching Hospital Birgunj
Monthly Record of USG Done
Baishakh to Poush (2066)

S#	Month	No of Cases	Remarks
1	Baishakh	371	
2	Jestha	398	
3	Ashad	369	
4	Shrawan	407	
5	Bhadra	321	
6	Ashiwin	305	
7	Kartik	370	
8	Mansir	391	
9	Poush	333	
	Total	3265	

National Medical College & Teaching Hospital Birgunj
Monthly Record of ICU Done
Baishakh to Poush (2066)

S#	Month	No of Cases	Remarks
1	Baishakh	16	
2	Jestha	18	
3	Ashad	14	
4	Shrawan	17	
5	Bhadra	15	
6	Ashiwin	17	
7	Kartik	16	
8	Mansir	19	
9	Poush	15	
	Total	147	

National Medical College & Teaching Hospital Birgunj
Monthly Record of NICU Done
Baishakh to Poush (2066)

S#	Month	No of Cases	Remarks
1	Baishakh	10	
2	Jestha	12	
3	Ashad	9	
4	Shrawan	10	
5	Bhadra	9	
6	Ashiwin	13	
7	Kartik	12	
8	Mansir	15	
9	Poush	13	
	Total	103	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Delivery Cases
Baishakh to Poush (2066)

S#	Month	No of Cases	Remarks
1	Baishakh	131	
2	Jestha	136	
3	Ashad	142	
4	Shrawan	136	
5	Bhadra	87	
6	Ashiwin	101	
7	Kartik	83	
8	Mansir	103	
9	Poush	107	
	Total	**1026**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Endoscopy & Lithotripsy
Baishakh to Poush (2066)

S#	Month	Endoscopy	Lithotripsy	Remarks
1	Baishakh	72	18	
2	Jestha	74	19	
3	Ashad	77	18	
4	Shrawan	87	20	
5	Bhadra	49	22	
6	Ashiwin	31	13	
7	Kartik	49	10	
8	Mansir	57	15	
9	Poush	41	11	
	Total	**537**	**146**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of OPD Patients
Baishakh to Poush (2066)

S#	Month	ECG (OPD)	ECG (Emer)	TMT	ECHO	CD	Total	Remarks
1	Baishakh	387	139	29	16	15	586	
2	Jestha	402	142	32	22	19	617	
3	Ashad	413	145	38	21	21	638	
4	Shrawan	328	150	28	16	11	533	
5	Bhadra	437	135	26	22	14	634	
6	Ashwin	324	186	19	14	7	550	
7	Kartik	372	165	12	11	5	565	
8	Mansir	437	126	17	13	6	599	
9	Poush	451	138	11	11	5	616	
	Total	**3551**	**1326**	**212**	**146**	**103**	**5338**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Advice to Patients
Baishakh to Poush (2066)

S#	Month	No of Cases			Remarks
		Male	Female	Total	
1	Baishakh	250	350	600	
2	Jestha	200	250	450	
3	Ashad	200	300	500	
4	Shrawan	205	226	431	
5	Bhadra	215	247	462	
6	Ashwin	222	266	488	
7	Kartik	212	258	470	
8	Mansir	256	272	528	
9	Poush	237	257	494	
	Total	**1997**	**2426**	**4423**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Pshisyotherapy
Ashad to Poush (2066)

S#	Month	No of Patients	Remarks
1	Ashad	65	
2	Shrawan	212	
3	Bhadra	523	
4	Ashiwin	566	
5	Kartik	604	
6	Mansir	680	
7	Poush	665	
	Total	**3315**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Vaccination Done in Preventive Clinic
Baishakh to Poush (2066)

S#	Month	BCG	OPD	DPT	Measle	T.T.	Hep."B"	Remarks
1	Baishakh	25	54	46	24	79	51	
2	Jestha	27	53	47	28	74	55	
3	Ashad	26	49	49	21	82	49	
4	Shrawan	27	41	32	22	77	36	
5	Bhadra	29	49	42	26	84	42	
6	Ashwin	28	46	39	24	79	39	
7	Kartik	26	43	37	21	76	34	
8	Mansir	30	47	41	24	88	38	
9	Poush	27	45	47	23	85	39	
	Total	**245**	**427**	**380**	**213**	**724**	**383**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of DOTS
Baishakh to Poush (2066)

S#	Month	No of Cases	New Cases	Referred	Attended	Remarks
1	Baishakh	12	2	2	420	
2	Jestha	13	2	3	450	
3	Ashad	12	3	1	450	
4	Shrawan	14	3	3	405	
5	Bhadra	13	2	2	455	
6	Ashwin	12	2	1	435	
7	Kartik	14	4	3	443	
8	Mansir	17	6	5	522	
9	Poush	14	5	3	488	
	Total	**121**	**29**	**23**	**4068**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Accupuncture
Ashad to Ashwin (2066)

S#	Month	No of Patients	Remarks
1	Ashad	56	
2	Shrawan	258	
3	Bhadra	242	
4	Ashiwin	228	
	Total	**784**	

National Medical College & Teaching Hospital Birgunj
Monthly Record of Vaccination Done in Preventive Clinic
Baishakh to Poush (2066)

S#	Month	OPD	Indoor	Delivery	Investigation	Operation	LSC	Free Days
1	Falgun	2320 (100%)	2346 (100%)	45 (100%)	NA	64 (100%)	2(100%)	9 Days
2	Chaitra	9271 (100%)	8269 (100%)	129 (100%)	17%	241 (100%)	5(100%)	31 Days
	Total	**11591**	**10615**	**174**		**304**	**7**	**93 Days**

From 1st Baishakh 2066 to 31st Ashwin 2066

S#	Month	OPD	Indoor	Delivery	Investigation	Operation	LSC	Free Days
1	Baishakh	9316 (100%)	8661 (100%)	128 (100%)	(25%)	285 (100%)	3(0%)	31 Days
2	Jestha	9428 (100%)	8830 (100%)	130 (100%)	(25%)	329 (80%)	6(0%)	31 Days
3	Ashad	9617 (100%)	8844 (100%)	135 (100%)	(26%)	359 (80%)	7(0%)	31 Days
4	Shrawan	5718 (50%)	5153 (60%)	88(66%)	(20%)	214 (80%)	4(0%)	0 Days
5	Bhadra							
6	Ashwin							
	Total							

Note: Operation and LSCS were (100%) free from 2062/03/22 to 2062/03/22 on the occasion of the "Birth Day of His Majesty King Gyanendra"

National Medical College & Teaching Hospital Birgunj
Record of Free Camp
From 22nd Falgun 2065 to 31st Ashwin 2066

S#	Year	Month	Day	No of Cases			Remarks
				Male	Female	Total	
1	2065	Falgun					100% Medicine free X 7 to 10 Dayss
2	2065	Chaitra					
3	2066	Baishakh	18	73	39	112	
4	2066	Jestha	29	53	34	87	
5	2066	Ashad					
6	2066	Shrawan					
7	2066	Bhadra					
8	2066	Ashwin					
		Total					

Camp of Hypertension and Diabetic

S#	Year	Month	Day	No of Cases			Remarks
				Male	Female	Total	
1	2065	Falgun					
2	2065	Chaitra	16	72	36	108	100%
3	2066	Baishakh					Medicine free
4	2066	Jestha	1	116	46	162	X 7 to 10
5	2066	Ashad	5	65	23	88	Days
6	2066	Shrawan					
7	2066	Bhadra					
8	2066	Ashwin					
		Total					

Camp of Hypertension and Diabetic

S#	Year	Month	Day	No of Cases	Remarks
1	2065	Falgun			
2	2065	Chaitra			100%
3	2066	Baishakh			Medicine free
4	2066	Jestha	29	85	X 7 to 10
5	2066	Ashad			Days
	Total				