BUSINESS PROCESS RE-ENGINEERING IN KHULNA SHIPYARD

By

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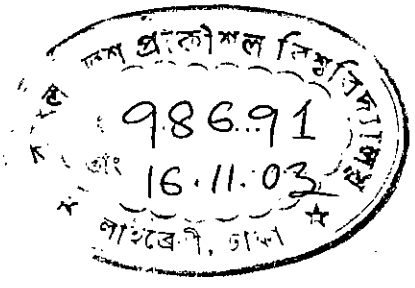
A thesis submitted to the Department of Industrial & Production Engineering, Bangladesh University of Engineering and Technology, Dhaka, in partial fulfillment of the requirements for the degree of Master of Engineering in Industrial & Production Engineering (IPE).



October 2003

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ACKNOWLEDGEMENT

First and foremost, the author would like to express sincere thanks and heartiest honour to his project supervisor Dr.M.Ahsan Akhtar Hasin, Associate Professor, Department of Industrial and Production Engineering (IPE), Bangladesh University of Engineering and Technology (BUET), Dhaka for his constant guidance, full fledged support, valuable advice and overall encouragement from the inception to the completion of this project work. The author is also extremely indebted to him for the support by providing materials/books related to this project work.

The author also expresses his deep sense of gratitude to Dr.Md.Golam Mohiuddin Professor, Department of Industrial and Production Engineering, and Dr. A K M Masud Assistant Professor, Department of Industrial and Production Engineering, BUET for their agreement to act as examiners of the project thesis.

The author is grateful to the concerned authorities of Bangladesh Navy who all has permitted and allowed to perform the project work at Khulna Shipyard. The author is also grateful to the concerned authorities and personnel of Khulna Shipyard who all has allowed and assisted to visit Khulna Shipyard, as well as helped in all respect to collect necessary information and data. Especially the author would like to acknowledge the contributions of those offices who agreed to give their valuable time and suggestions regarding Khulna Shipyard, it's past, present and future.

The author would like to extend thanks and gratitude to his teachers of the department, colleagues, classmates and other friends who helped him directly or indirectly in furnishing the total work.

Finally, the author would like to thank his wife, Tanjin Munir Eva for her encouragement, support and also typing the manuscript some times.

It is to be mentioned that, different comments has been made in the report regarding management and activities of Khulna Shipyard. These are not criticisms rather, limitations, which need to be improved/taken care off in order to increase productivity. Even then if somebody feels offended then the author is extremely sorry for that.

Author

ABSTRACT

Considering the maritime importance, inland water transport requirements and assistance to the industries in southern part, Khulna Shipyard Limited (KSY) was established in 1954-57 by the then Pakistan government in Labanchara on the bank of the river Qazi Bacha, Khulna. It is basically a jobshop production oriented industry for Shipbuilding, Ship repair and other various engineering works. But, with the elapse of time the plant machinery started getting older and older. Moreover due to many other reasons KSY turned to a burden of the Government and at its age of 41 years, the Government declared it as a sick industry. Finally it was decided to handover KSY to Bangladesh Navy to run it commercially and was handed over to Bangladesh Navy on 09 May 1999. After taking over by Bangladesh Navy it undertook different programmes to make KSY a profitable industry.

This project work is the outcome of an attempt to study Khulna Shipyard and re-engineering its processes. The main feature of Khulna Shipyard has been discussed in brief. In order to ascertain the bottlenecks of KSY the existing management and their policy, working facilities, capabilities & limitations of the workshops, employees and their status, customers, cost, quality of products, inventory status and policy, causes of idle man hour production etc. has been analysed.

In order to achieve dramatic improvements in quality, cost, capital, service, speed, performance, productivity and customer satisfaction through Business Process Reengineering few vulnerable areas has been selected and necessary recommendations has been made accordingly.

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LIST OF ABBREVIATIONS USED IN REPORT

ATO: Assistant Technical officer

BN: Bangladesh Navy

BPR: Business Process Re-engineering

BS: British Standard

BSEC: Bangladesh Steel & Engineering Corporation

CBA: Collective Bargaining Agent

C&F: Clearing& Forwarding

DGM: Deputy General Manager

EOQ: Economic Order Quantity

GM: General Manager

ISO: International Organization for Standardization

IT: Information Technology HRM: Human Resource Management

KSY: Khulna Shipyard Limited

KW: Kilowatts

MD: Managing Director

MS: Mild Steel

MT: Master Technician

MW: Megawatts

NHQ: Naval Head Quarters

PDB: Power Development Board

PM: Purchase Manual

SMT: Senior Master Technician

SPC: Statistical Process Control

SQC: Statistical Quality Control

TC: technical Committee

TQM: Total Quality Management

QM: Quality Manual

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

To survive and prosper a business must adapt to the changing requirements of its customers and to other internal and external pressures. An organization's response and the kind of change required will depend on its situations and circumstances. A demanding and turbulent business environment, formidable competitors, technological innovation and low barriers to entry put a premium on learning, flexibility and responsiveness. The variety, scale and intensity of the challenges have made people receptive to talk of 'revolution'. Although not all enterprises face the imminent threat of extinction, some require more than mere evolutionary change. The scaling back of internal resources to match declining external competitiveness can result in a negative spiral of cutbacks and layoffs. This may not be avoided by the incremental adaptation offered by Total Quality Management (TQM). Companies are therefore turning to reengineering, whether it is one or more of their business processes; their total organization; or the way in which business is done within their particular marketplace. [Colin, 1994]

Thus the reengineering of business process is concerned with fundamentally rethinking and redesigning business processes to obtain dramatic and sustaining improvements in quality, cost, service, lead-times, outcomes, flexibility and innovation (Hammer and Champy, 1993).

1.2 BACKGROUNDS AND STATEMENT OF THE PROBLEM

Khulna Shipyard Limited (KSY) is the first and the biggest shipbuilding industry of Bangladesh. It was established in 1954-57 by the then Pakistan government in Labanchara on the bank of the river Qazi Bacha, Khulna. It is basically a jobshop production oriented industry for shipbuilding, ship repair and other various engineering works. With the elapse of time the plant machinery started getting

older and older. On the other hand most of the regular customers like sugar mills, jute mills, power station, newsprint mill, hardboard mill etc became mostly sick industries. So they hardly place any work order to KSY. As a result KSY turned to a burden of the Government and at its age of 41 years, the Government declared it as a sick industry. Then the Government was looking for a capable private entrepreneur to handover KSY, but finding no other alternatives finally it was decided to handover KSY to Bangladesh Navy (BN) to run it commercially. Bangladesh Navy took over the responsibilities of KSY since 09 May 1999. This research aims to evaluate possible improvements by reengineering the total organization.

1.3 OBJECTIVES OF THE STUDY

The main objectives of this project work are:

a. Study the current state of Khulna shipyard, along with its business processes.
b. Identify critical processes for re-engineering.
c. Evaluate the inventory status and policy of KSY.
d. Suggest for re-engineering the processes.

1.4 METHODOLOGY

In order to carryout the project work a comprehensive review of relevant literature on BPR implementation through concerned books, journals, websites and publications were done. The literature review provides a ground of the research and focus, as well as establishing a basis for implementing BPR in a relevant organization. Khulna Shipyard Limited is selected as a model to implement BPR. In that view Khulna Shipyard Limited has been visited several times and relevant information and data were collected.. The steps may be illustrated as:

a. In order to investigate into the present state of KSY, the previous history obtained from various sources, is studied.
b. Present working facilities, capabilities and performance of the entire

production department (workshop) as well as service departments (support department) are evaluated.

c. The knowledge and awareness of the workers and management about quality control is evaluated.
d. The assessment of existing systems to determine compliance or degree of compliance with the standard like ISO 9000 is considered.
e. Inventory status of KSY and its ABC (First, Medium and Slow moving) classification and EOQ are analyzed.
f. Finally the qualitative and quantitative techniques as per requirements are recommended for re-engineering the processes.

1.5 SOURCES OF INFORMATION

Basic information regarding Business Process Reengineering (BPR) has been collected from different reference books, journals, publications and websites. All other required data and information regarding Khulna Shipyard has been collected as mentioned below:

Khulna Shipyard Limited was a forgotten industry and almost no organized details background and history was found. So, the background and history part has been collected from few publications written by some Naval officers who were working there since taken over by Bangladesh Navy and some other experienced Employees working for last 20 ~ 30 years. As there was no formal study on KSY before, so there is no readymade information about the present status and position. So, each and every corner of KSY has been visited and extensive interviews have been taken to grasp required information at all levels (from workers to MD). In addition proposed website, some previous audit reports, and inventory list of all workshop were also studied. Finally higher authorities of KSY working at Naval Headquarters were also consulted for clarification.

1.6 SCOPES AND LIMITATION OF THE STUDY

Though KSY started production in 1957 but no Balancing, Modernization, Rehabilitation and Expansion (BMRE) was actually conducted over its entire life

of 43years. As a result slipway carriage, the main workshops as a whole the total KSY have been in dire state with old and obsolete machinery. (Baten, 2000)

Once naval control was established at KSY, there has been a general improvement on the average moral of the personnel. BMRE has been planned in modified form and will be executed phase wise for the overall development of the yard. (Baten, 2000). Even though development and progress processes is a continuous phenomena, which has no end. Al-Mashari and Zairi (2000) suggest that reengineering of business processes involves changes in people (behaviour and culture), processes and technology. As a result there are many factors that prevent the effective implementation of BPR and hence, restrict innovation and continuous improvement.

KSY is a moderate standard shipyard. It has wide variety of machineries and different production and internal service departments. Because of time constraint detail study in every individual areas and their analysis could not be carried out. An overview of the whole KSY and the major contributing areas of production are studied.

CHAPTER TWO

BACKGROUND STUDY& LITERATURE REVIEW

2.1 INTRODUCTION

Business Re- engineering or Business Process Redesign, as advocated by some researchers and consultants, involves starting with a clean sheet of paper to design the processes of a company without referring to the existing processes or modes of operation. The practice of Business Re- engineering is not new. But the new is the jargon of Business Re- engineering believed to have been coined and popularized by Michael Hammer, an MIT computer science professor turned management consultant. Ever since the 'invention' of re- engineering, there has been an exponential increase in the number of researchers and consultants working in this field. However, not everyone defines re- engineering in the same way, and not everyone agrees on what Re-engineering should do and deliver. [Colin,1994].A frame work for conducting Re-engineering is proposed which deviates somewhat from that clean sheet approach in that it allows systematic and incremental changes to be made to an organization in a given condition. Rules for re- engineering can be spelled out and the execution can be automated.

2.2 BACKGROUND TO BPR

The term business process redesign was first used in the Massachusetts institute of technology's (MIT) research programme 'Management in the 1990s' which ran from 1984 to 1989.During this project, researchers such as davenport and short (1990) observed that successful organizations were using IT systems in ways which were more advanced than the traditional automation of clerical and operational tasks. Venkatraman (1991) elaborated on these observations and identified BPR as the third of five levels of IT-induced organizational transformation. The term BPR was used quite precisely to describe the use of it to transform the way in which an organization works internally rather than simply to automate the way that it already worked. The ideas were then further popularized by Hammer in his seminal article '*Re-engineering work: don't*

Automate, obliterate' which appeared in Harvard Business Review in 1990. He warned against 'paving the cow paths' with IT and suggested that organizations should rethink their business by capitalizing on the opportunities provided by the new information technologies. [Gerard Burke and Joe Peppard_1995]

2.3 WHAT IS A BUSINESS PROCESS?

A business process, according to Hammer and Champy(1993),is a "collection of activities that takes one or more kinds of input and creates an output that is of value to the customer ".The definitions of a business process by Davenport and Short (1990) is most similar to that by Hammer and Champy (1993), with a "collection of activities" being replaced by "a set of logically related task", and the crossing of organizational boundaries being highlighted.

2.4 WHAT IS RE- ENGINEERING?

Michel Hammer after 1990 further developed the concept of reengineering in a book: "*Reengineering the Corporation*," written jointly with James Champy. They provided the following definition: "Reengineering is the fundamental rethinking and redesign of business processes, to achieve dramatic improvements in critical contemporary measures of performance such as cost, quality, service, and speed." [Hammer and Champy, 1993]. Again Morris and Brandon, defines Re -Engineering as, " analyzing and altering the basic work processes of the business"[Morris and Brandon, 1993].

2.5 WHAT IS BUSINESS PROCESS RE- ENGINEERING (BPR)?

Business Re-engineering as defined by Michael Hammer (Hammer and Champy,1993) is, "the fundamental rethinking and radical redesign of an entire business system - business processes, job definitions, organizational structure, management and measurement systems, values and beliefs- to achieve dramatic improvements in critical measures of performance (cost, quality, capital, service, speed)." Hence, Business process Re-engineering (BPR) is just a subset of Business Re-engineering (BR) according to Hammer and Champy (1993).

Business Process Re- engineering, as defined by Tapscott and Caston (1993),is"a

fundamental revaluation/ redesign of a company's business processes and organizational structure in order to achieve dramatic improvements in its critical success factors quality, productivity, customer satisfaction and time to market etc ." This definition is most similar to that of Hammer with the exception that it refers to a process in particular.

According to Morris and Brandon (1993), "re-engineering is an approach to planning and controlling change. Business re- engineering means "redesigning business processes and then implementing the new processes." In this definition the purpose of the change is not explicitly stated, but the implementation of the change is highlighted.

The AT&T Quality steering Committee (1991) defines re-engineering as "the redesign and implementation of a process or a major part of a process to meet new customer requirements or achieve significant improvements in process performance." Again, this is another Hammer ' look –alike' definition, though the focus is on process only, and the objective of the change is not specified in greater details such as cost, quality capital, service and speed.

Butler Cox Foundation,(1991) defines BPR as,---"a way of transforming the business, which frees it from the restrictions of the traditional approach by cutting across functional divisions. Information systems --- are the fundamental ingredient of redesigned business processes."

Business intelligence (1993) defines BPR as, "The transformation of a company from one based on functions such as accounting, marketing and manufacturing to one based on processes such as order processing and fulfilling customer expectations."

Hall, Rosenthal and Wade (1993) also regard re-engineering as "the redesign and improvements of business processes both in depth (roles and responsibilities, measurement and incentives, organizational structure, information technology, shared values and skills) and breadth (activities to be included) which can lead to long term profit". Again the focus here is on business processes. However, the ' things' to be changed are discussed in detail. One of the objectives highlighted was long-term profit.

Davenport (1993) takes it one step further. According to him, "A revolutionary new approach that uses IT and HRM to dramatically improve business performances." Business re- engineering or business processes redesign is only part of what is

necessary in the radical change of processes. The term 'process innovation' was suggested by him to encompass the envisioning of new work strategies, the actual process design activity, and the implementation of change in organizations involving human beings and technology. Hence, his definition is the most dynamic one of all the above.

Gerard Burke and Joe Peppard, given their opinion regarding the term BPR as,' "An approach to organizational improvement

- Which seeks opportunities for fundamental transformations
- By focusing on the processes by which the organization delivers products or services to its stakeholders."

2.6 BUSINESS RE-ENGINEERING REPRESENTS A LARGE CHANGE PROGRAMME

Business re-engineering differs from other change programmes (such as quality circles.

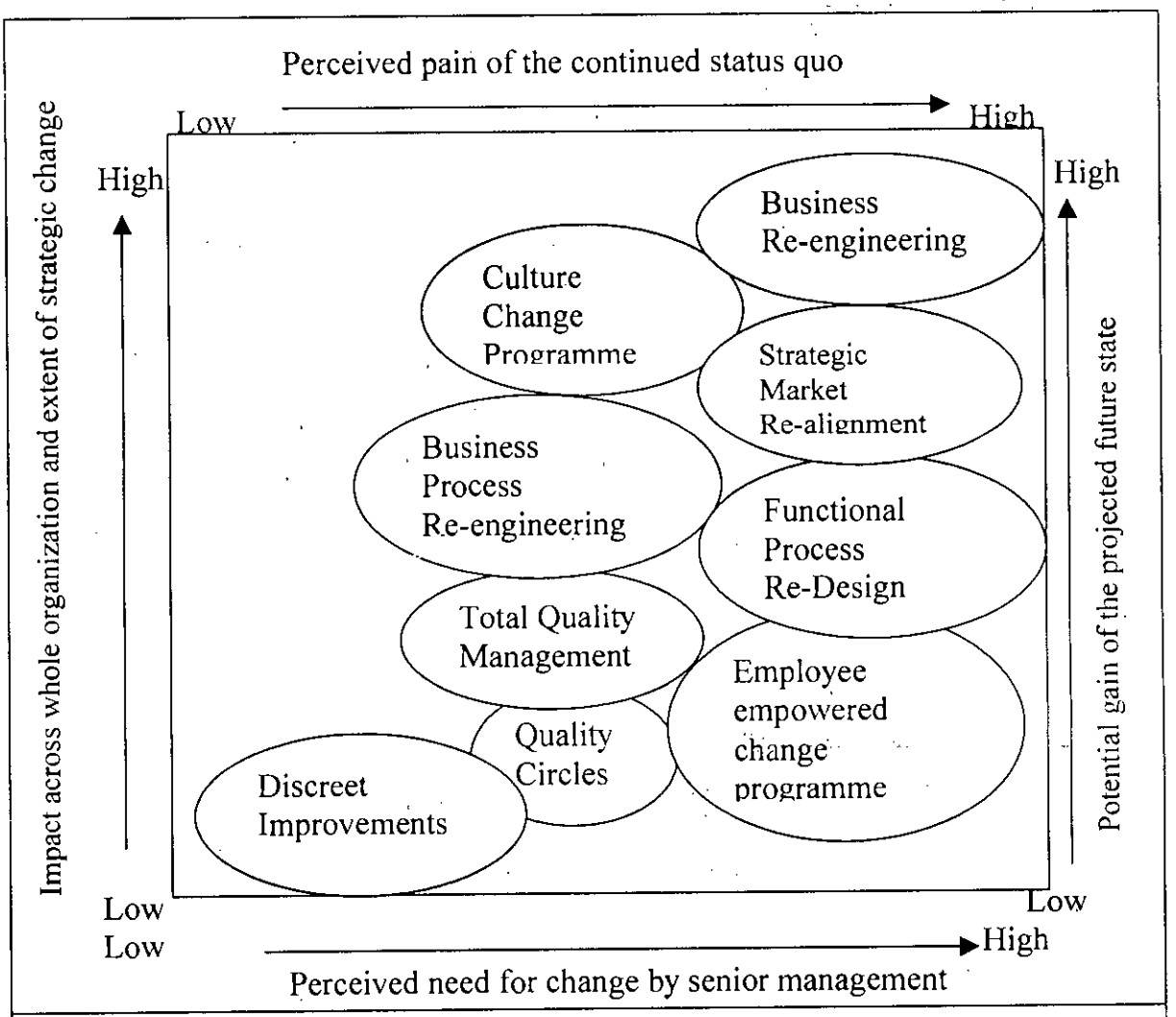


Figure 2.1: Business re-engineering represents a large change programme

TQM, process re-engineering ect) as it typically demands a high degree from each variable as shown in the figure:2.1. If the variables do not score highly, then the re-engineering should not be attempted. [Nick,1994].

2.6 CLARIFYING OBJECTIVES AND METHODS

The organization needs to learn how to clarify and set objectives, and how to employ

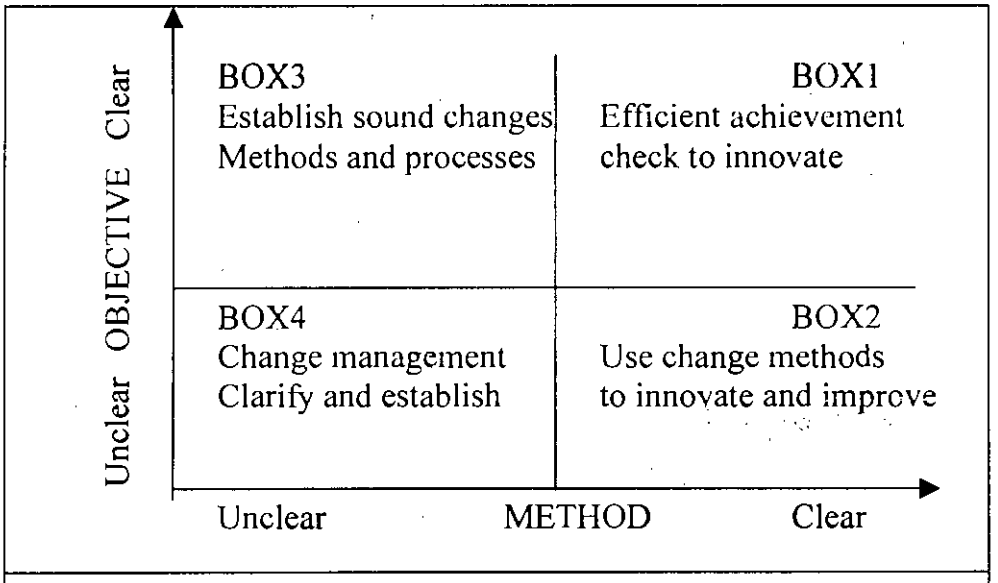


Figure: 2.2 Clarifying objectives and methods

improved methods and processes to meet those objectives. Thus an organization needs to be always at box 1,as shown in Figure: 2.2. Once in 1999 KSY was in Box no.4, and the total management has been changed. Now the aim of the new management should be to reach at the BOX 1, through BOX 4 and BOX 3 as soon as possible.

2.8 WHAT MAKES BPR HAPPEN?

Organizations tend to embrace the need for radical change only when there are significant external threats or pressure. Are there particular types of threat, which prompt organizations to undertake BPR as opposed to any other type of improvement programme? In that point of view, it may be considered that KSY was declared as sick industry and as a result it was handed over to BN to run commercially. Why it became sick? The answer of the question will lead to the requirement of BPR in KSY.

Before considering BPR, number of internal circumstances like improvement of internal law and order situation, completing pending works of the customers, minimum amount of working capital has been earned.

The diagram shown in figure: 2.3 outlines a process to make the radical change of Business Re-engineering happen, following the four simple steps. The two additional

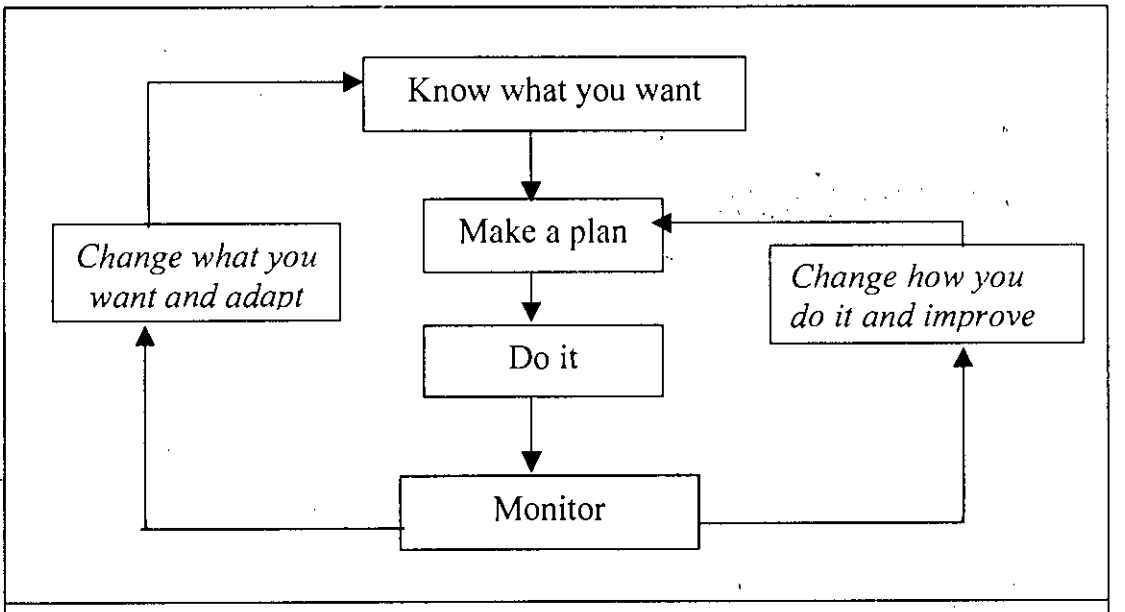


Figure:2.3 Four steps to Business Re-engineering

steps in two sides are also important, and represents firstly, when the change fails to result you intended, and, secondly, how to improve continually and adapt to key stakeholders and market needs. This is important, as one of the main benefits of undertaking a radical Business Re-Engineering programme is that it allows the organization to become flexible, responsive, and able to change and react quickly. An organization needs to be able to change rapidly not just once, but continually in order to keep up with the changing market.

2.8.1 *Know What You Want*

Before any large organizational Business Re-engineering or strategic change is undertaken, it is need to understand the current processes, what is that to be changed and why to be changed. This requires a fair amount of analysis, discussion and thinking. On the other hand, it is also argued that paying too much

attention to the current way of doing things may constrain the likelihood of identifying radically different approaches. Perhaps this is a question of achieving an appropriate level of understanding of current processes. However, if the action is not thought out, both the what and the how, the chance of failure is high. So, it is useless re-engineering a process when the output for that process is not wanted. There are three stages to this first step of 'Know what you want'.

- Clarify the need for, and the organizational ability to, change.
- Clarify how to serve the needs of stakeholders (customers, employees, suppliers, shareholders) better.
- Construct a' framework for success' to assist communication and planning.

Bearing in mind the four variables needed as a background for a re- engineering programme (Figure2.1), it needs to analyze, how much the organization is willing to change, and how much pain is associated with the status quo. This will help to formulate tactics later on. It is also needed to understand how well the organization has managed to change in the past, and if lesson have been learnt. This will help decide what, if any, outside consultancy will be required –what the likely support for change is going to be across the leadership.

There are various tools and techniques for analyzing stakeholders' needs, some of which will be discussed latter. The process for gathering this information should include small cross-functional project teams from the organization who can work and share together their findings, and lay the foundation for decision-making. The project team should include not only the key decision makers, but also some of the people who will likely be involved in future implementation.

During this stage of analysis, a high level-look is to be given at the key processes, which the organization employs to meet the needs of the customers. How much effort is spent on the activities that make up the process, and how long the overall duration of the process is. How much of the effort is 'value added' (i.e. directly serves the customer) versus non-value added (i.e. administrative routines)? Do the outputs of the process meet the needs of the customers? Are all the inputs necessary? One can either do such analysis by using process mapping techniques

('brown' fields approach) or by identifying the required outputs and starting with a clean slate ('green' fields approach) or ideally by using a mix of both approaches.

The analysis of the key stakeholders should give a clear answer to 'Where are we now, and what direction are we heading in?' The next question to answer is: 'where should we be going?' To do this some additional analysis on the external environment needs to be done- 'competitors strength and weaknesses are key. By now the analysis will give some indications where change is necessary, and what potential solutions may be.

By the end of this first stage one should have a full understanding of the organization and its environment, and the overall mission, strategic goals, general initiatives and their detailed objectives. What future behavior is needed by individuals in the organization to move from the current state to the future state? This is the basis of the change that needs s to be carried out.

2.8.2Make A Plan

During the first stage of the change process ('Know what you want'), one will have to define the overall mission or vision statement for the organization, backed up by strategic goals to meet the needs of the key stakeholders. Each goal will have been broken down into general initiatives, with each initiative supported by detailed objectives. These objectives should be 'SMART'—a mnemonic for Specific, Measurable, Achievable, Results-oriented and Time deadline.

The second stage of the change process ('Make a plan') is to detail the action and resources, which are going to turn these objectives into reality. Each objective should be backed up by a project plan. Each project plan should be drawn up by a small core cross-functional project team given the responsibility and authority to deliver the change, led by a project manager. The team should be trained in project management as well as in the team dynamics.

The best approach the team can use to plan the implementation is to employ project management planning techniques, possibly backed by a simple computer programme such as Microsoft project. They should also use workshops and meetings with those affected to ensure the implementation gains consensus. Each project should have a strict definition, which should include a specific project

objective, clear deliverables, and measures of success and definition of completion. The project plan should include tasks, deadlines, resource schedules, a critical path analysis, a clear programme, and a work-to –list' for those involved to follow. There should also be a clear understanding regarding the cost of the project, and the budget should be agreed in advance.

As there may well be several projects running at the same time, a transition team can be formed to oversee the planning, and subsequent implementation. However, change requires action, and action requires people. If all these people for the project team and the transition team come from within the organization, then one need to understand what action should be stopped to release the people. Too often re-engineering programmes fails because all the time is spent planning what should be done, and no thinking is devoted to what should not be done, (Or what current activities should be stopped immediately to release resources for the change teams).

At the end of this planning stage, it is worth having 2-3 days workshop with the project managers and their senior sponsors to check that everyone is signing from the same hymn sheets. Workshops are useful way to both plan the change and deliver training to give people the skills they need to implement the change.

At the end of this stage the action is planned, and all the players are in place. Next comes the hardest part-do it!

2.8.3 *Do It*

This section is split into two. The first part is the technical techniques that can be used to ensure some success in implementation. The second part is the cultural technique that can be used to help the organization deal with the trauma of change.

a. Technical techniques: The delivery of the change programme by project teams is an effective way of making it happen. Using senior executive as the project directors/sponsors ensures that top management does not lose control, and that the project teams get the support they need. The transition team should be tasked with the day-to-day management of the change. This will include communicating progress, resolving conflict about resources, making decisions about changing the methods employed - in short managing the

unforeseen exceptions to the planned approach, which was established in the planning phase. The transition team should report to the highest authority group in the organization (i.e. the board), and meet at least twice a month.

The important thing to remember is that the transition from the current state to the future state should be viewed as a separate state in itself. The use of a 'Project Coordination Center' (PCC) can also help success. The technical techniques involved are not magical, and are based on common sense. However, they need a background to operate within to ensure that political behavior does not upset the change being introduced. This background can be provided by the cultural techniques.

b. Cultural techniques: Any change programme will run a series of issues revolving around resistance, power and control. Change causes uncertainty and fear, and especially if it is imposed it causes a perceived loss of autonomy. Resistance should be overcome in a compassionate, empathetic and positive way. In order to combat resistance it is necessary to motivate constructive behavior. The second issue is power. In times of changes, the level of ambiguity and uncertainty increases, and individuals and groups take action based on their perception about how the change will affect their relative power in the organization. So, positive steps to be taken to ensure that key power groups support the change rather than block it. The third issue revolves around control. The transition should be seen as a separate state, and managed as such. The business should be managed separately from the change programme. This demands a high degree of control, as there is a real risk that if the change programme is not achieved, the wasted effort will adversely affect the business. To ensure control, the transition must be managed.

2.8.4 *Monitor*

Monitoring needs to concentrate on two things monitoring the progress of action, and monitoring the results. This monitoring should be done in a 'project coordination center' (PCC) set up specially for the process. The use of maps and

planning boards can assist both in revealing what is going on, as well as in communicating to people in the organization who comes in for information. PCC should be staffed by a small full-time team, headed by a change management director. He should report direct to the top of the organization and be a member of the Transition Team.

a. Monitoring progress of action: The PCC should monitor the progress of each project and report weekly to the transition team. The progress can be tracked via project managers. Any problems should be solved by the small PCC team, and brought to the attention of the Transition Team or the senior management. The PCC team should, with time, get a full understanding of where the blockages to change are, and what is needed to remove them. The overall monitoring of the project budget should also be undertaken, to ensure that the projects are not over spending.

b. Monitoring Result: The results should be directly linked to the individual projects' measures of success. These need to be quantifiable, and these should include just more than financial results. The monitoring should also include such measures as employee attitudes, customer's perceptions. supplier responsiveness, etc.

2.8.5 Change The Change And Continual Change

When things go wrong during implementation- and wrong they will go –then there are three options

- Doing nothing-accept the situation, or playing 80/20 game.
- Change what is done - one of the levers of cost, time or quality to be pulled. In many instances doing nothing is unacceptable- so the next option is to change what is done. This will involve replanning and going back a step (to Make a plan').
- Change what is wanted - major surgery, but only in dire emergency! This involves either scrapping the project (always an option), or changing the objectives.

2.8.6 The change process

Cross-functional project teams, transition management system, and the use of participative planning and action will, for many hierarchical organizations, be new and threatening. On top of that there will be the need for new skills such as competitor and market analysis, teamwork skills and project management techniques.

There are a variety of techniques, which can be employed to facilitate the process of change. The first simple step is to give the change programme an overall name, and even a logo- this gives it an identity, facilitates understanding and allows for the vital separation of the change programme from the day to day running of the organization. In addition there should be a variety of other elements employed, either all or some depending on the size of the programme:

- Use of culture change programme
- Use of cross-functional project teams
- Workshops
- Use of facilitators
- Training seminars etc.**[Nick 1994]**

2.9 THE RE-ENGINEERING SPECTRUM

A measure of the different way in which organizations have interpreted the concept of re-engineering lies in the range of ambition of those who are applying it.The value of the spectrum is that it provides a guide to the degree of mindset change, typical scope, target gains and risk of each approach as described below:

2.9.1 Process Improvement

This approach is being adopted by a number of firms but is not re-engineering in the truest sense of the word. It usually entails improvement of that part of a process that falls within a particular function rather than of the entire end-to-end process (eg the financial appraisal task within a new product development process). As such the focus tends to be on improving the tasks that are done rather than eliminating the delays

between each step. Typically the need for the process goes unchallenged and there is little critical appraisal of the overall process. Such initiatives can yield improvements of five to twenty per cent but rarely have a noticeable impact on overall business performance.

2.9.2 Process Re-Engineering

This is the approach adopted by the largest group doing what one would call true re-engineering. This involves the fundamental rethinking and radical streamlining or total

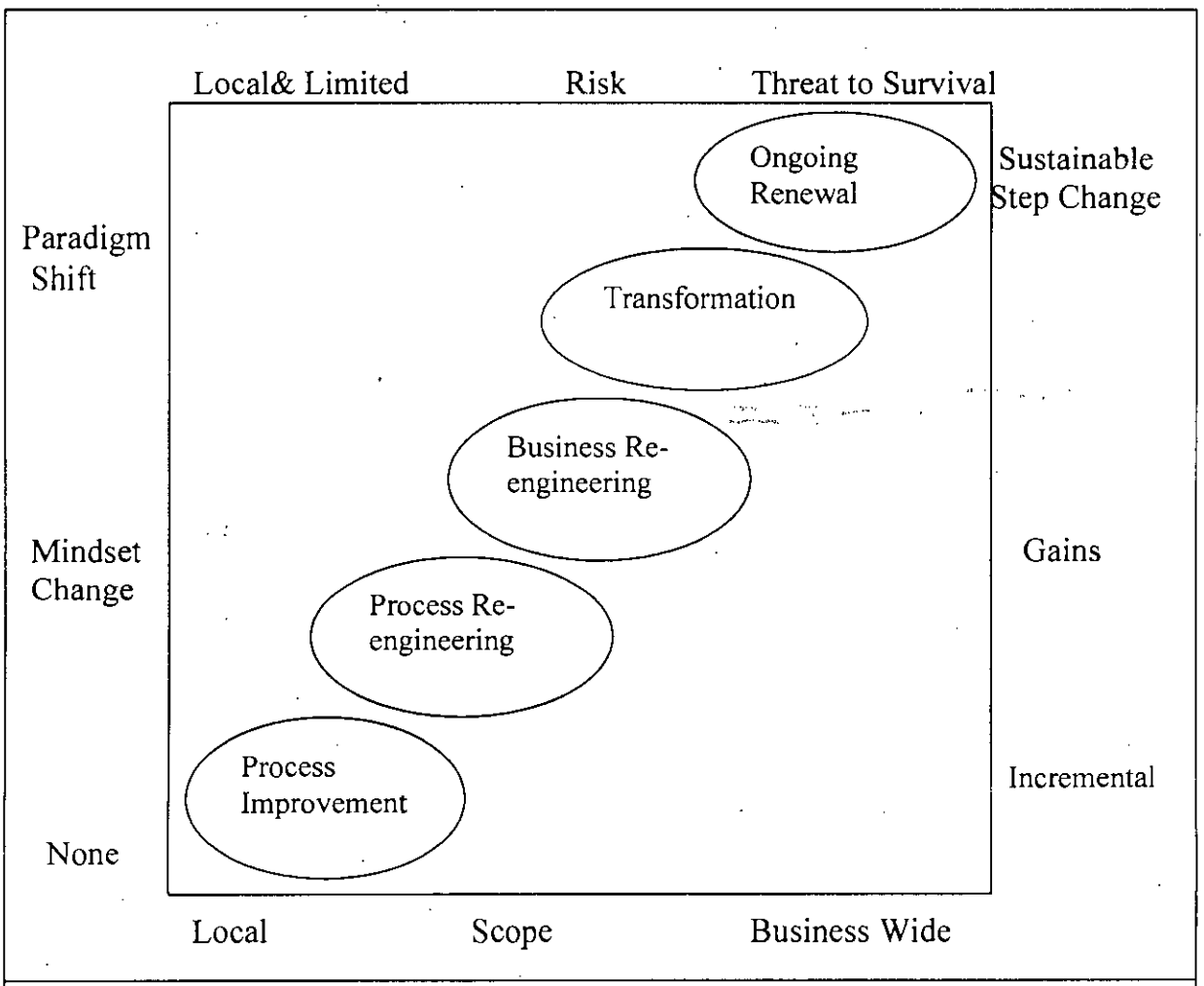


Figure: 2.4 The re-engineering spectrum

redesign of an end-to-end process and may start with the question 'should we be doing it all?' such projects are usually targeted to deliver step change improvements of fifty per cent or more in critical measures of process performance such as cost, perceived

quality and cycle time.

Process re-engineering should only be adopted if the desired improvements cannot be achieved using less painful and demanding approaches. The impact of successful initiatives can show through on the bottom line. However, if only one or two processes are redesigned then much of the business remains untouched and there will be only a marginal overall improvement in the organisation's performance.

2.9.3Business Re-Engineering

Firms that are seeking step change improvements across all of their processes typically adopt this approach. Hence, there is usually greater emphasis on appraisal and redesign o f the entire business architecture. Such approaches usually demand significant top-level commitment and active involvement. Success will be demonstrable through step change improvements in both the performance of individual processes and of the business as a whole.

2.9.4Transformation

A small but growing number of organizations are recognizing that there is a need to 'reinvent the business'. Such firms start by asking why they exist and what they are trying to achieve. Only then do they go on to look at how they actually run their processes to achieve those goals. The tests of genuine transformation might include:

- Step change improvement against all critical measures/ benchmarks of business performance.
- The perceptions amongst staff that the business is a dramatically better place to work than 3-5 years ago.
- A belief amongst customers, suppliers and other business partners that the organization has become far easier and far better to work with and has helped them save time and cost.
- Organization- wide clarity of purpose, direction, business architecture, capabilities and true mission.

2.9.5Ongoing Renewal

Those that have completed successful transformations recognise that the process never actually stops. The techniques and newly shaped mindset have to become part of the organization's DNA so that it can continue to refocus and reinvent itself as the world

around it changes.

In practice, the majority of initiatives currently being labeled as reengineering sit somewhere between process improvement and process re-engineering. There is no implicit criticism or praise associated with being at any point on the spectrum. The important thing it brings out is the need for honesty and clear communications between all involved. There is little point in the chief executive talking about transformation and expecting equivalent performance gains if those running and designing the initiative are actually focused on achieving more humble performance improvements. Similarly there is little point attempting transformation if the techniques used are only ever likely to deliver more limited gain[Colin,1994].

2.10 IDENTIFYING THE FUNDAMENTAL BREAKTHROUGHS

There has been much talk of the benefits and scale of potential returns on the re-engineering investment. However, while some have reaped rich rewards, for many of

START POINT	BREAK THROUGH	OUTCOME
▪ Function/Hierarchy driven organizations	PROCESS BASED	▪ Customer led ▪ Added value focus ▪ End to end management
▪ Layered complexity ▪ Friction and Conflict	FUNDAMENTAL RETHINK	▪ Zero based ▪ First principles redesign
▪ Incremental gains ▪ Decreasing ROI	RADICAL IMPROVEMENT	▪ Step change ▪ Sustainable
▪ Single focus improvements ▪ Incoherent change	INTEGRATED CHANGE	▪ Balanced improvement ▪ Viable solutions
▪ Command and control ▪ Fear and confusion	PEOPLE CENTRED	▪ Empowerment and involvement ▪ Business awareness
▪ Unwritten rules and constraints ▪ Tied to history	MINDEST CHANGE	▪ Learning organization ▪ Forward looking

Figure: 2.5. Fundamental breakthroughs

the organizations that have tried to apply it, re-engineering has failed to live up to its initial promise. The reason in many cases is that the latter have not made the necessary breakthrough to new ways of thinking and working.

The experience of those that have realized dramatic gains suggests that there are six critical areas in particular in which attitudes and approaches need to be overturned completely. As can be seen from the diagram given below, the emphasis is on forcing the organization to tackle head-on many of the complexities and inefficiencies that have evolved over time and now act as a major hindrance to progress. [Colin,1994].

2.11 INTERPRETING THE OPPORTUNITITIES

2.11.1 Corporate Anorexia Or Growth Hormone

The motivations for those considering re-engineering can be categorized into two broad groupings. The majority of initiatives are motivated by a desire to cut costs

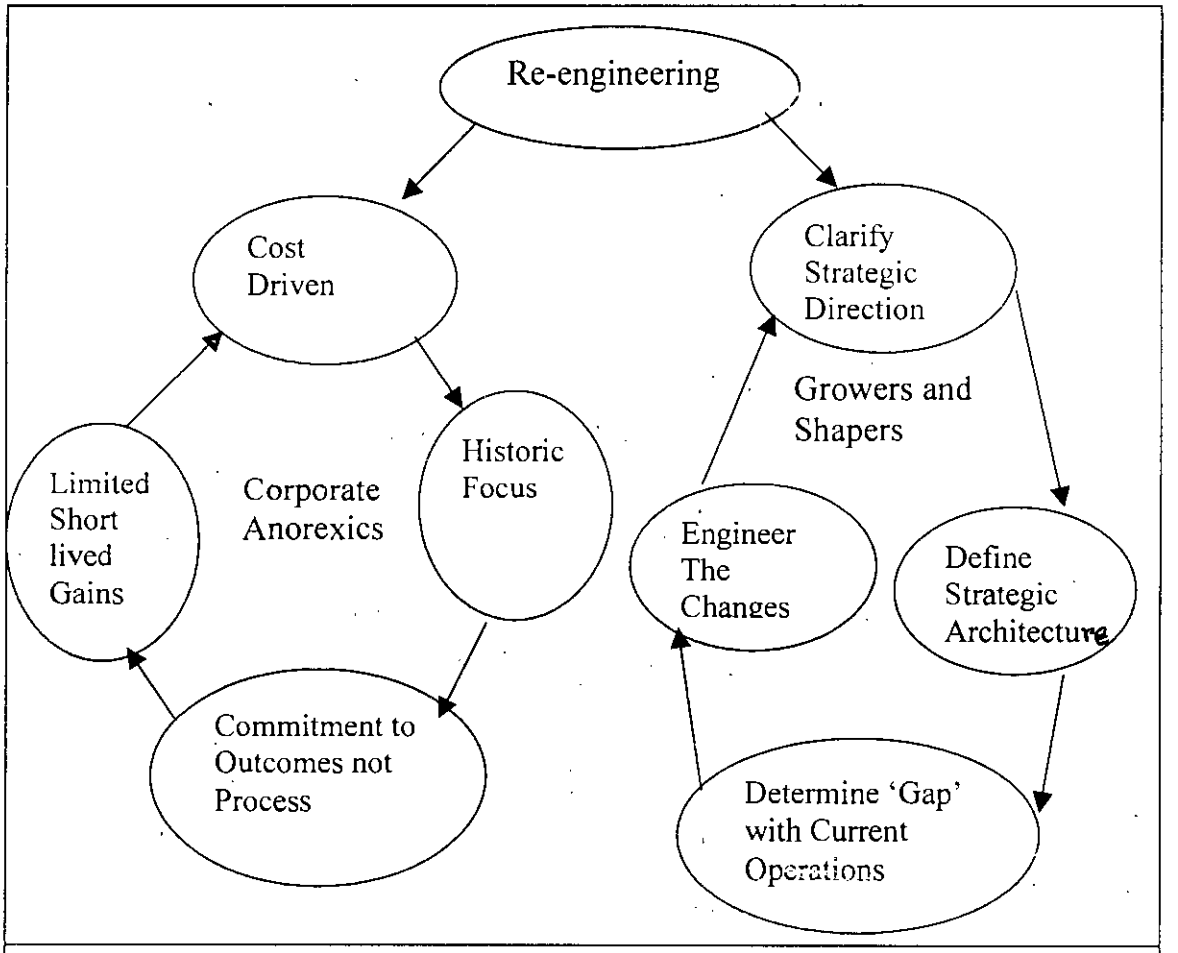


Figure 2.6: Interpreting the opportunities

treating re-engineering as just the next wave of corporate anorexia. Obviously, enhanced customer service will always be a motivation, but the underlying cost concerns tend to dominate.

The problem in such cases is that the overriding concern for cost reduction forces to focus on historic cost information as starting point. The risk is that to create a redesigned process to meet the needs of yesterday rather than tomorrow. Furthermore, those at the top tend to be concerned solely with achieving the desired outcomes and have little commitment to the change process itself.

The second, more optimistic, but currently less popular, motivation is that of rethinking the organization and creating a platform from which to grow and shape future success. This normally involves a four-stage process:

2.11.2Clarify Strategic Direction

The aim here is to create a clear and widely communicated picture of:

- Vision -how the world should feel for the stakeholders.
- Mission - how to actually add value for those stakeholders.
- Goals - the desired scope, scale and speed of growth for operation.
- Commercial proposition – the capabilities, resources, partnerships, alliances, products and services that will help to achieve success.
- Stakeholders – all those who believe they are in interest in how the business performs.
- Performance measures – the balanced scorecard of indicators through which the progress and performance against stakeholder expectations will be measured.

2.11.3Defining Strategic Architecture.

This involves creating the organization's blueprint or road map that sets out how the organization will achieve the strategic direction. The rationale is that, traditionally, one has to start with the organization's structure and then try to map work on it. The architectural blueprint works to a different premise. The thinking

here is that infrastructure should actually be designed to enable the efficient working of the process which allows to exploit distinctive capabilities in support of the strategy.

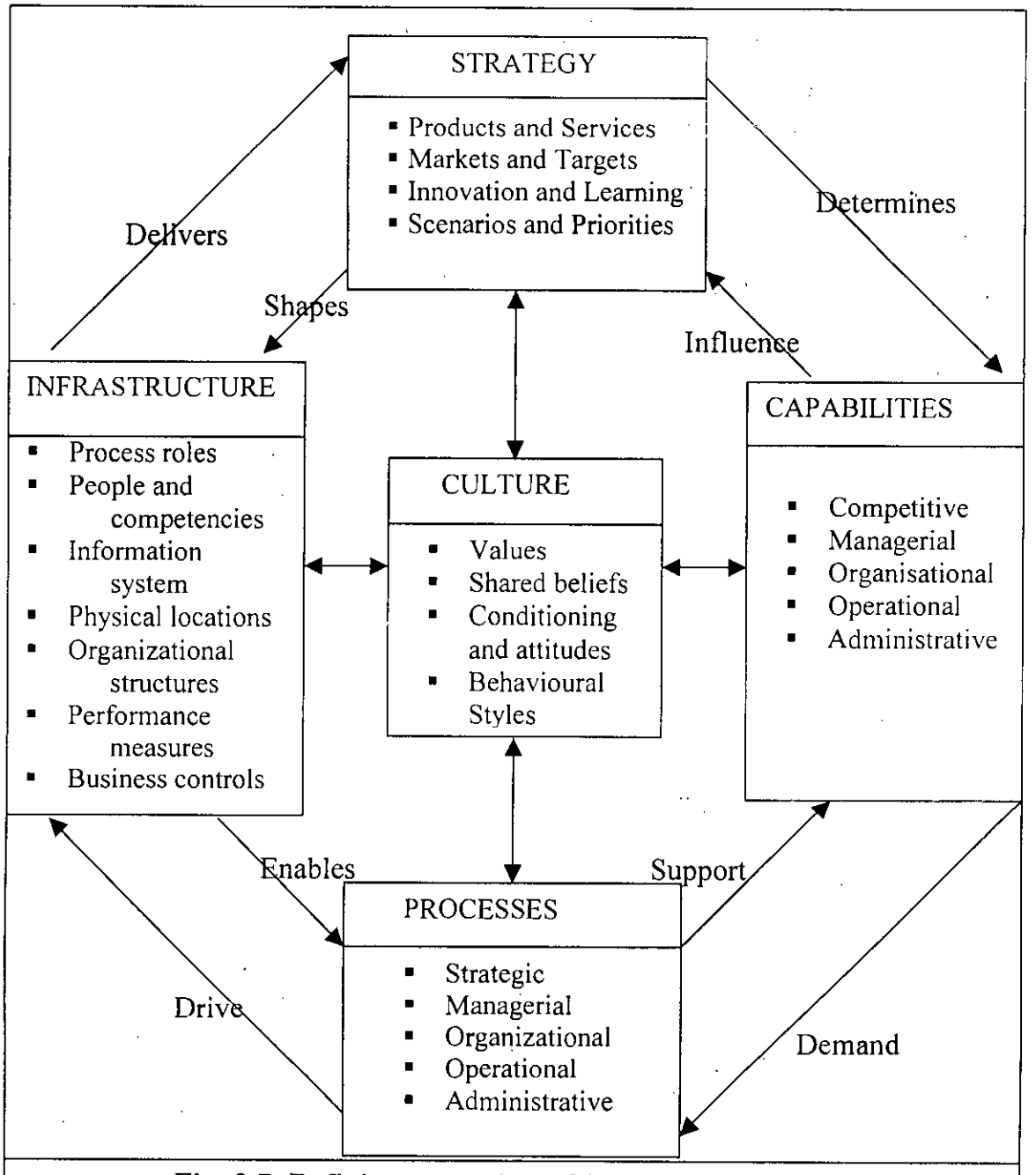


Fig: 2.7: Defining strategic architecture

2.11.4 Determine Gap With Current Operations

Having mapped out the desired strategic architecture, one can evaluate where the current position is and the gap between the two.

2.11.5 Engineer the changes

After assessing the size of the gap one can decide how best to close it and whether using a series of discrete steps will do it or a big bang- 'total change' approach. Engineering the change for most companies is typically an iterative process, which involves a series of discrete steps through which, rethinking and reinvention of the organization is done.

2.11.6 Rethinking The Organization

The objectives for the three key elements of the 'total rethink' approach to re-engineering- strategy; processes and management are outlined below

a. Revisiting business strategy

The key challenges here are to:

- Ask the naïve and challenging questions about why the business exists, what it is trying to achieve, whether we would pay for the activities that went on if we were the customer or owner, and how we would do things differently if starting again?
- Identify our distinctive capabilities/core competencies and determine their strength, the ease with which they can be replicated by competitors, how well they are exploited currently and the depth of understanding of those capabilities amongst the workforce.
- Examine where, how and why we add more or less value than our competitors and assess how this matches up to customer needs and expectations.
- Force a continuous and fundamental reassessment of product and customer profitability-with an open and results-driven appraisal of the value of the often emotionally charged subject of loss leaders.
- Go beyond the often bland and manipulable concept of customer surveys, and engage all levels of the organization in regular face-to-face contact with customer- possibly through focus groups.
- Understand the different segmentations of customers that we serve and assess the priorities and trade-offs between service, functionality, quality and price for each

segment.

- Assess the organization's capacity for, and openness to, continuous learning, innovation and a diversity of ideas and opinions.

b. Redesigning business processes

The objectives and outcomes of any fundamental reappraisal of business processes should be to:

- Eliminate unnecessary tasks and reduce any delays introduced by multiple authorizations, inspections and hand-offs between departments.
- Ensure that process roles can be fulfilled by multiple staff and that staff are trained to perform multiple roles.
- Concentrate the responsibility for end-to-end tasks into single roles (eg case handlers in insurance) or small workgroups; automate the flows of work to minimize delays between processing stages where multiple participants are involved.
- Reduce the amount of paper handling and rekeying of data by promoting the use of electronic documents, by minimizing the storage of paper copies of electronically generated documents and by encouraging electronic communications both internally and with customers and suppliers.
- Create a balanced set of process performance measures covering both external and internal needs eg quality, service levels, customer satisfaction, cycle time, throughput, resource efficiency, bottlenecks, error rates and costs.
- Build staff understanding of the business objectives, the end-to-end design and the critical performance measures for the processes they work on.
- Equip staff with the tools and techniques to allow them to take responsibility for the continuous review and refinement of the processes they work on

c. Rethinking management approaches

Middle and junior management face potentially the greatest shift in roles and responsibilities in the re-engineered business. The challenges for them are to:

- Increase staffing flexibility by creating a multi-skilled workforce.

- Reduce duplication of effort and investment by forming stronger partnerships with customers and suppliers, sharing key information (eg point of sale data vs. sales forecasts), undertaking joint developments and entering into quick response networks which help eliminate multiple storage points in a supply chain, cut total inventory costs within the chain and reduce replenishment cycles.
- Improve cross-functional communications to speed up issue resolution and the development of new products and services.
- Give staff the freedom and authority to execute the responsibilities with which they have been empowered.
- Encourage the continuous challenging and elimination of non-value adding tasks, outsourcing those which are still required but which divert time and resources from critical business activities.
- Move from command and control models of managerial behaviour to one in which the prime responsibilities are to help staff make sense of the environment and the challenges they face.
- Encourage learning and the acquisition and exploitation of new knowledge by staff at all levels. [Colin, 1994].

2.12 TOOLS OF BPR

Basically there are two types of BPR Tools, namely Analytical Tools and Process Tools. The analytical tools and techniques are used by the organizations to help senior management teams clarify a situation in order to facilitate decision-making. The best way to analyze the needs of the key stakeholders is to actually talk to them, and listen with an open mind.

There are different Tools to understand fully the needs of the key stakeholders in the organization (typically Customers, Suppliers, Employees and Shareholders).

But all of them are not require using in the same organization that is the situation will determine which the best tools are. Again no one approach will give the complete picture, so number of techniques is to be used to get a full feeling of what is going on and what the options are. Few tools seem to be suitable for using in KSY is stated below.

2.12.1 Tools For Customer Analysis

a. Five 'Cs' and 'Ps'

The five Cs and Ps (Figure2.8) are just a checklist of things one should look at and understand when considering the needs of customers, the environment in which they exist, and how well their needs are matched by the organization. (both by the products and people) and by other competitors. They are useful tools for comparing with the competition, and also for comparing with current state to the future state the organization wish to achieve. The gap between the two will indicate the scale of the change the organization needs to achieve.

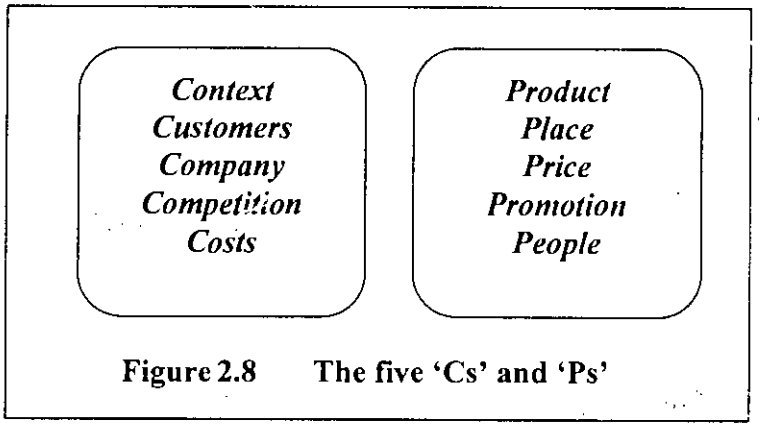


Figure 2.8 The five 'Cs' and 'Ps'

b. SWOT analysis

A SOWT analysis (Figure2.9) is a good summary of research into how customers and others view the organization. The use of SWOT should be done with care, as

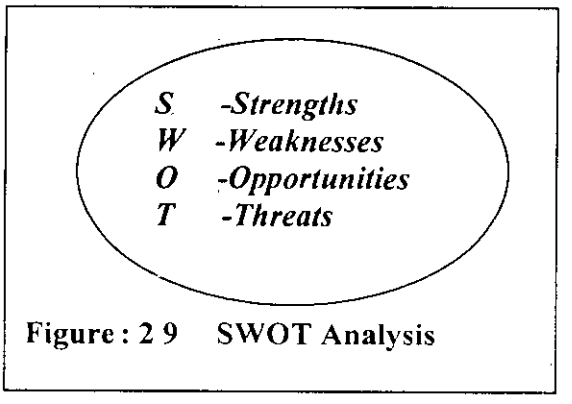


Figure : 2 9 SWOT Analysis

it gives perceptions (which may not be facts). However, assuming that people's perceptions are their reality, it is a useful tool. It is worth using across a variety of

groups so comparisons can be made-for example, comparing senior management's perceptions to those of customers in a SWOT format may show how 'in tune' the top of the organization is with the customers! And further comparisons with staff perceptions may highlight internal issues as well.

c. Value versus Cost

The two general ways of competing are either by delivering High Perceived Value (HPV) or by achieving Low Delivered Cost (LDC). In reality most organizations

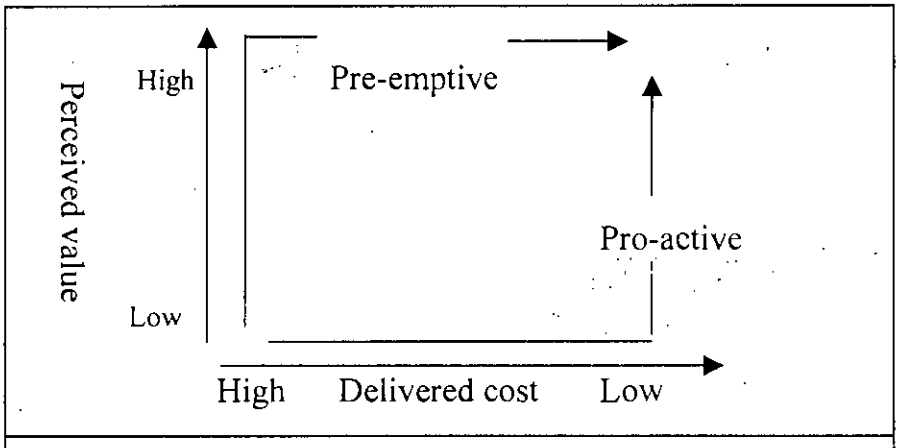


Figure:2.10 Value versus Cost

try to achieve a degree of each. There is also the option of moving from being an LDC operator to an HPV position, whilst maintaining an LDC base (Figure2.10).

d. Market versus Product

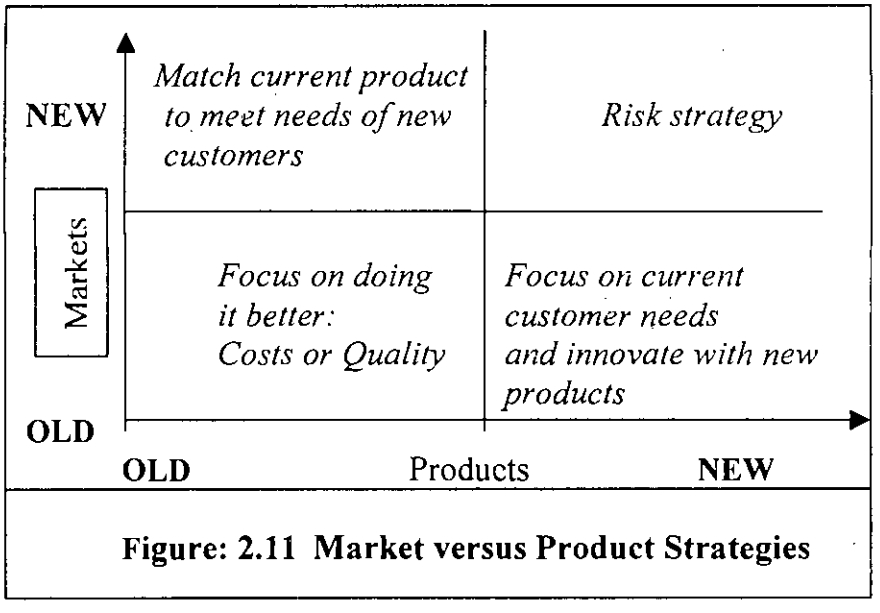


Figure: 2.11 Market versus Product Strategies

To expand market share and increase revenue the four options shown in figure 2.11 are possible. Moving into new markets with new products straight away is the riskiest, and should be avoided.

e. Product quality versus service delivery

In Figure :2.12 the obvious box to avoid is the losser's box! The way to use this matrix is to map the position of company on it compared to the compertitors. To get the data one will need to interview customers using qualitative means

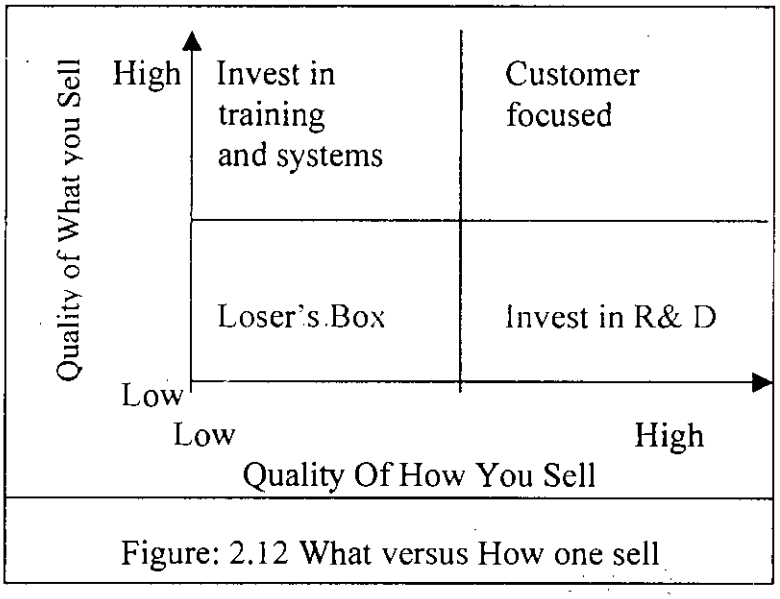


Figure: 2.12 What versus How one sell

(structured questionnaires that can be scored) and qualitative means (focus group discussion with customers using trained external facilitators/market researchers). One can plot using bubbles to denote market share, and shading to denote profitability.

2.12.2 Tools For Supplier Analysis

a. Value Chain

Unless one has fully integrated business, either his initial raw material or final end product/service to the customer will depend on suppliers. For KSY most of the raw material supply is related to suppliers. It is worth understanding what value the supplier adds to the overall business system. If one takes the final price paid for a service/ product as 100 per cent, then working back through the business

system can construct a value chain.

Once a value chain is constructed it is useful to see exactly what 'value added' is provided by the various parts of the business system. There are two ways of using this information:

Do it better. This can be achieved by entering into closer relationships with the suppliers, and jointly exploring options to reduce lead times/costs. The savings can either be used to reduce prices (to become more competitive) or invested to increase quality.

Change the rules. Changing the rules gives a competitor more sustainable advantage, as others cannot typically respond without fundamentally changing as well.

b.Supplier availability versus value added

Once the value added of the suppliers is established, various options can be studied by checking the availability of suppliers. The suppliers can be plotted onto a standard matrix as shown in figure 2.13

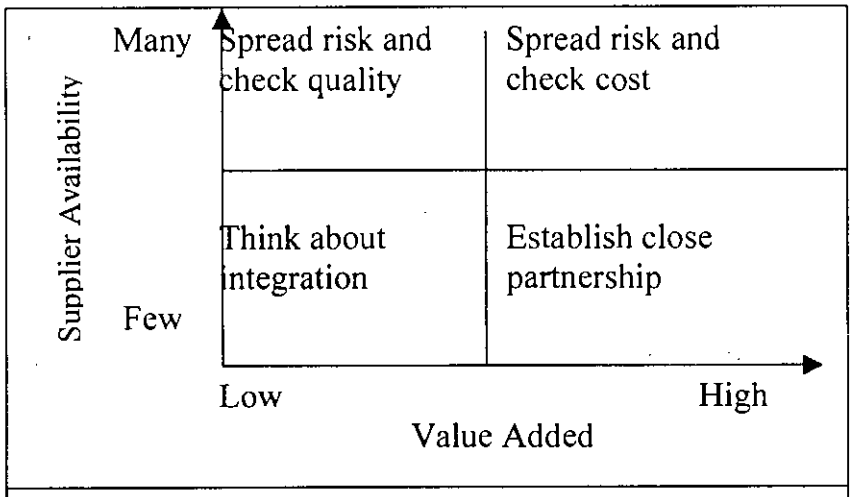


Figure:2.13 Supplier availability versus value added

The fact that one is using an outside supplier implicitly suggests that he has made the make/buy decision. This decision should be revisited if the value added is low and supplier availability is limited. Integration is always an option. If there are many suppliers then either quality or cost (depending on the value added)would be the primary concern (although both need to be borne in mind!), and it is worth

spreading the risk to guard against supplier failure.

2.12.3 Tools For Employee Analysis

Employee analysis can be broken into two areas: 'Hard' analysis, and 'Soft' analysis. The later is often ignored, but is no less important. The tools which one can use in both areas, and which are detailed below, are as follows:

- **Hard Analysis**: employee turnover, days sickness, employee productivity, organizational structure, process analysis and business process re-engineering.
- **Soft Analysis**: Culture, competitive energy, strategic acceptance, values versus strategy, behavioural influences, leadership style, ect.

2.13 THE PRINCIPLES OF BPR

Various lists of important points or principles of BPR are listed below. [Colin, 1994]. All of them may not be suitable for a particular company. Certain principles may be given a priority in the context of KSY BPR exercise.

- Externally, focus on end customers and the generation of greater value for customers.
- Customers and users to be given a single and accessible point of contact through which they can harness whatever resources and people are relevant to their needs and interests. This principle is driving many of the one-stop type BPR programmes within the public sector.
- Internally, focus on harnessing more of the potential of people and applying it to those activities which identify and deliver value to customers.
- Learning and development by building creative working environments to be encouraged.
- Activity to be think and executed horizontally as possible, concentrating on flows and processes through the organization. This concern led to the emergence of document management. However, in some of the flexible network and project based forms of organization that are beginning to emerge, notions such as vertical or horizontal have little meaning.
- Non-value added activities to be removed, parallel activities to be undertaken, response and development time to be speed up. Some

consultants are placing great emphasis on competing on speed, as this is an area in which significant and measurable improvements can be made.

- Concentrate on outputs rather than inputs, and link performance measures and rewards to customer related outputs. Customer and employee satisfaction surveys now provide key inputs into many corporate management processes.
- Give priority to the delivery of value rather than the maintenance of management control. The role of the manager is being redefined and an emphasis on command and control is giving way to empowerment, and the notion of the coach and facilitator.
- Network related people and activities. Various surveys undertaken in the late 1980s (summarized in Coulson-Thomas, 1992) revealed that the majority of the chief executives aspired to a network form of organization.
- Move discretion and authority closer to the customer, and re-allocate responsibilities between the organization, its suppliers and customers.
- Encourage involvement and participation.
- Ensure people are equipped, motivated and empowered to do what is expected of them.
- Wherever possible, people should assume responsibility for managing and controlling themselves
- Work should be broadened without sacrificing depth of expertise in strategic areas.
- Avoid over-sophistication.
- Keep the number of core processes in an organization to a minimum.
- Build learning, renewal, and short feedback loops into processes.
- Ensure that continuous improvement is built into implemented solutions.

2.14 THE CHOICE, RADICALVS INCREMENTAL CHANGE

Many organizations face a stack choice between evolution and revolution. Will incremental improvement be enough? In deciding whether to seek incremental improvements or a step change in performance, the following could be among the

factors that are considered: [Colin, 1994].

- How well is the organization performing, and how big is the gap between where it is and where it would like to be? Could the gap be bridged by improving or building on what already exists? Alternatively, is the gap so large that the organization needs to `throw away and start again?

- What else is happening? Have customers suddenly become more demanding? Are other similar organizations performing significantly better? Has an innovative development occurred which is revolutionizing existing ways of operating? Is there a need to respond to a radically different direction and strategy?

- How stable is the environment, or framework, within which the organization operates? Where the environment is relatively static or unchanged from one year to the next, a management team may not feel under any particular imperative to change. However, it might still opt to undertake some blue skies thinking about different ways in which an existing product or service might be delivered.

- Is the mode of organization or mode of operation appropriate in the situation and circumstances? Does organizational capability match both organizational vision and customer requirements? If the answer to these question is no, then a radical transformation may be required. If, however, an organization is thought to be broadly appropriate, then all that may be required is fine-tuning in areas of relative deficiency.

2.15 CRITICAL SUCCESS FACTORS

Successful re-engineering requires a number of complementary factors, including a desire to change, the courage to search for ambitious outcomes, the active participation at each phase of the people of the process, and top management commitment. The latter is sometimes lacking because many of those wishing to

undertake fundamental transformations are insecure.

The critical decision is whether the organization is ready for re- engineering. They can then assess whether they have or can build the necessary capability and leadership to make a success of it. The assessment of these factors will always be more of a subjective than objective exercise. While a number of people advocate the use of some form of scoring mechanism, the real value lies in the discussion and discovery process that those in leadership positions go through to determine their readiness for re-engineering. To help start that process Colin J Coulson offered his own non-exhaustive checklist:

Leadership- demonstrated through a combination of top level bravery in launching the initiative, defining bold ambitions and taking difficult and potentially unpopular decisions, sustaining commitment through the highs and lows of the project, being patient in allowing people to make mistakes, being open to criticism and getting actively involved.

Direction if the re-engineering programme is not simply to create a better process for yesterday's needs it must be driven by a clear and consistent strategic focus and an evocative long-term vision.

Motivation expressed in a passionate desire to change the status quo and challenge inappropriate structures and behaviors in order to create a totally customer focused organization.

Integration fundamental change demands that we address the entire strategic architecture and seek balanced improvements across all elements of it.

customers the organization needs to engage in a continuous dialogue with customers to determine their requirements, priorities and trade-offs and to understand how best we can help them serve their customers.

Participation we need a design for change that seeks to engage people at every level of the organization and gain their active support and involvement- preferably in cross-functional teams.

Ambition the goals for the change programme must be stretching -out of reach but not out of sight.

Rethink re-engineering provides an opportunity to look at the organization through a new lens. By challenging the prevailing mindset we can help the organization understand the need for change and unleash the skills, learning, creativity and innovation required to bring about radically new process designs.

Support the process cannot and should not be led by external consultants but they can perform valuable roles such as design adviser, coach, facilitator, catalyst and devil's advocate.

Communication the critical challenges here are to ensure that we test the interpretation of those to whom we communicate- both inside and outside the organization- to surface and discuss residual concerns, fears and doubts and to maintain an open dialogue throughout the change process.

Measurement the performance indicators used should assess both the change process itself and the resulting achievements against targets. The outcomes- positive and negative-need to be shared openly if the organization is to learn and make progress.

Technology information technology (IT) should be viewed as an enabler not the driver of change or the guardian of past practice. The challenge is to decide firstly what the organization wants from the application of IT in the business and then determine how to manage IT as a business in order to achieve those objectives.

Passion a change of this scale needs to be seen as something more than business as usual-particularly by those not directly involved. The passion of those leading the change and their ability to enthuse others can help to generate and sustain momentum and support-particularly during the difficult stages.

Humanity the most critical assessment of the organisation's performance in managing any accompanying people changes will be made by its own staff. Any suspicion of heavy handedness or dishonesty will undoubtedly reflect in the morale and commitment of the work force. [Colin,1994].

CHAPTER 3

DESCRIPTION OF KHULNA SHIPYARD LIMITED

3.1 BACKGROUND HISTORIES AND HANDOVER OF KSY TO BN

Bangladesh has a considerable size of inland water transport fleet and to support this fleet there exists a good number of shipbuilding and ship repairing industry. Among them Khulna Shipyard (KSY) Limited is the first and the biggest shipbuilding industry of Bangladesh. Once its name and fame was not only known within this country, but also in South East Asia for her modern machineries and slipway system of docking the vessels.

KSY was established by the then Pakistan Government in Labanchara on the bank of the river Qazi Bacha, Khulna. Total Area of the KSY is 68.97 acres, with 1800ft riverfront. The construction of Khulna Shipyard Limited was begun in 1954, financed by the then East Pakistan Industrial Development Corporation .M/s Stulcken, SOHN, German, provided the design for the construction of the yard facilities. The construction was completed in the year 1957 and was commissioned on 27th November 1957. KSY was incorporated as a public limited company with an authorized share capital of Tk. 7.5 crore where Tk. (Rs) 3 crore was paid up capital. Each share had a face value of Tk. (Rs) 10. The shares were distributed on 1st March1966. According to the Memorandum of association of Khulna Shipyard Limited (vide companies act 1913), the objectives of the company were as follows:

a. Shipbuilding, ship repair and engineering works.

b. Manufacture vessel up to 300 ft length and 700 tons lightweight (2000 tons Dead Wt.)

c. All types of foundry works, ferrous casting upto10 tons (single casting), all types of non-ferrous casting up to 400 lbs.

d. All types of machine works, engineering works such as manufacture and fabrication of various industrial parts, pumps, steel structure etc and wood works.

Shipbuilding is an ancient profession in this part of the world and Bangladesh

excelled in the skill from early days. Though Shipbuilding, ship repair was the main function of KSY. But in the early sixties a good number of industries like sugar mill, jute mill, power station, newsprint mill, hardboard mill etc had been growing in the southern part of the country. Subsequently they also became important customer of KSY for different engineering works. One of the most important facts is that the company started construction works with significant amount of Bank loan. Moreover the project started operation with loss and could not make any profit during the first five years of its operation. So the Bank loan could not be paid in time and the loan started increasing with the interest, which became one of the major causes of turning into losing concern. From 1962-68 the company showed a little profit margin. Again from 1969 to 1973 it had suffered loss. After independence of the country, the ownership of all shares was transferred to the Government of Bangladesh in May 1972 and the company was placed under Bangladesh Steel and Engineering Corporation (BSEC). The period from 1973 to 1984 can be termed as the golden period of Shipyard where it suffered no loss and highest amount of profit was shown in1976-77 fiscal year. After 1984 the company started suffering and there had been no profit. The annual production capacity of KSY was about 5500 tons of steel equivalents, which actually could never be achieved. With the elapse of time the plant machinery started getting older and older. The heart of all activities of KSY is the slipway carriage, which broke down 3 to 4 times. Every time due to lack of working capital it's repair work was delayed. These breakdown interrupted production activities and subsequently caused late delivery of the vessels to the customer's alongwith liquidity demurrage. Bank loans started increasing with high amount of interest rate. All these problems were augmented by the inefficient management system in a volatile environment of Collective Bargaining Agent (CBA). Moreover, most of the regular customers like sugar mills, jute mills, power station, newsprint mill, hardboard mill etc became mostly sick industries so they hardly place any work order to KSY. As a result KSY turned to a burden of the Government and at its age of 41 years, the Government declared it as a sick industry. Then the Government was looking for a capable private entrepreneur to

handover KSY, but finding no other alternatives finally it was decided to handover KSY to Bangladesh Navy (BN) to run it commercially. Bangladesh Navy took over the responsibilities of KSY since 09 May, 1999.During handing over of KSY total liabilities of 93.36 crore Taka were shared by Bangladesh Navy, BSEC and Bank. Out of which only BN paid Tk. 61.46Crores.(Zaman2000, Baten 2000 & Haresh,2001).

3.2 ORGANIZATION OF KSY

KSY is a fully commercial organization supervised by Bangladesh Navy. For supervision there is a board of Directors composed of 08 (eight) officers of BN and the joint secretary of the Ministry of Defense. The 08 (eight) officers of BN are The Chief of the Naval Staff being the Chairman of the board, 4 Principal Staff officers of the Naval Headquarters (NHQ), Commodore Superintendent BN Dockyard, Commodore Commanding Khulna and the Managing Director of KSY is the member Secretary.

A well-experienced & senior Captain of BN is appointed as the Managing Director (MD) of KSY. Under the MD there are three General Managers (GM), known as G M (Ship Building & Engineering), G M (Design &Planning), G M (Administration) and one Deputy General Manager (Finance) Usually the GMs are of the rank of Captain also, and Deputy General Manager's (DGM) of the rank of Commander. Under each GM there are DGM and under each DGM there are number of workshops. Depending upon the task and size each workshop/ section have an Officer-in –Charge (OIC). OIC's are either from BN of the rank of Lieutenant Commander or from civil. Each workshop/ section has few Engineers / Sub Assistant Engineers, /Senior Foreman/ Foreman, and good number of skilled / semiskilled permanent Technicians and labors. Again there are also skilled / semiskilled / unskilled Technicians and labors as casual, those who are employed as per requirement on daily /weekly/monthly basis through contractor. Casual workers are also the important workforces of the organization.

The present organization structure of KSY is shown in the following diagram

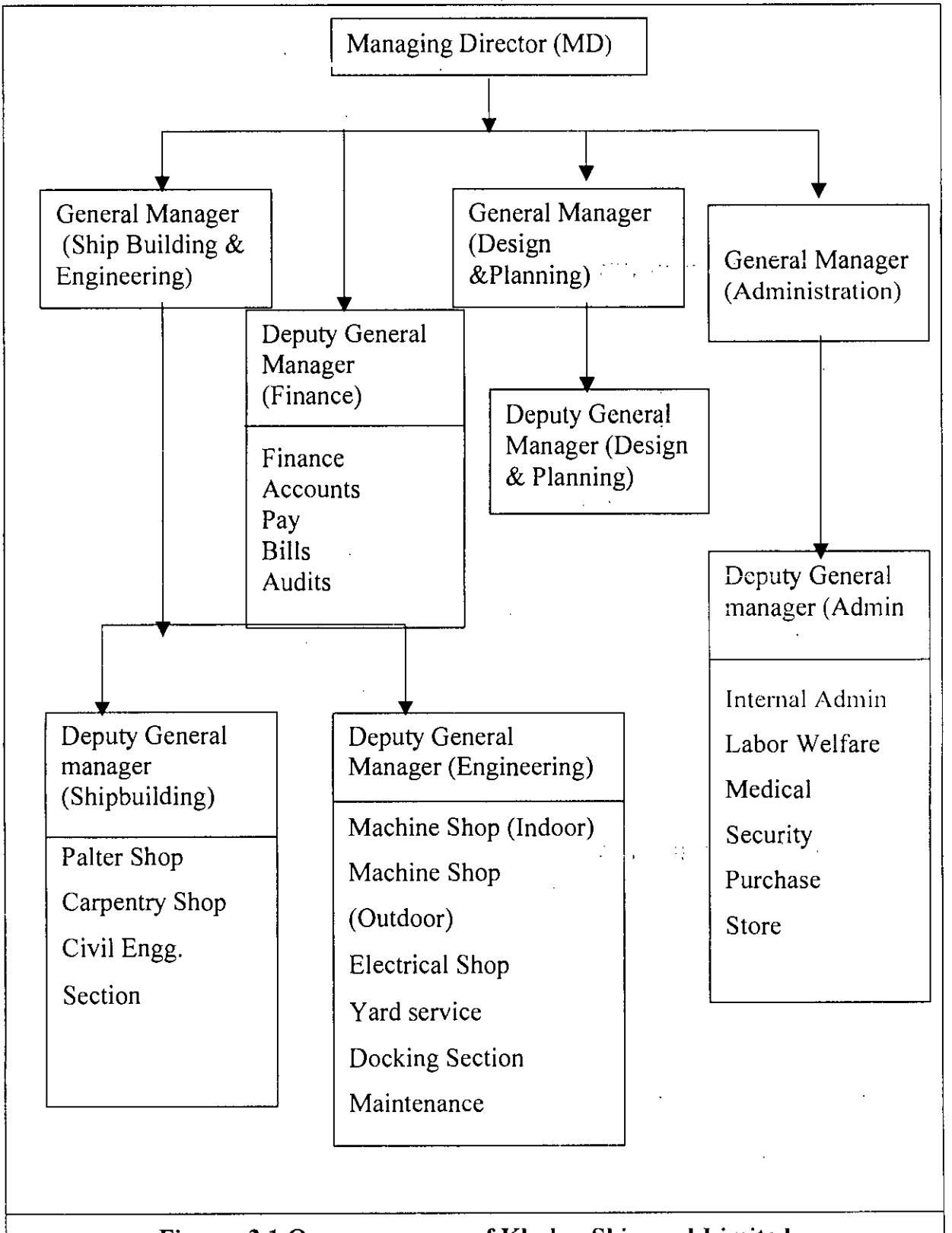
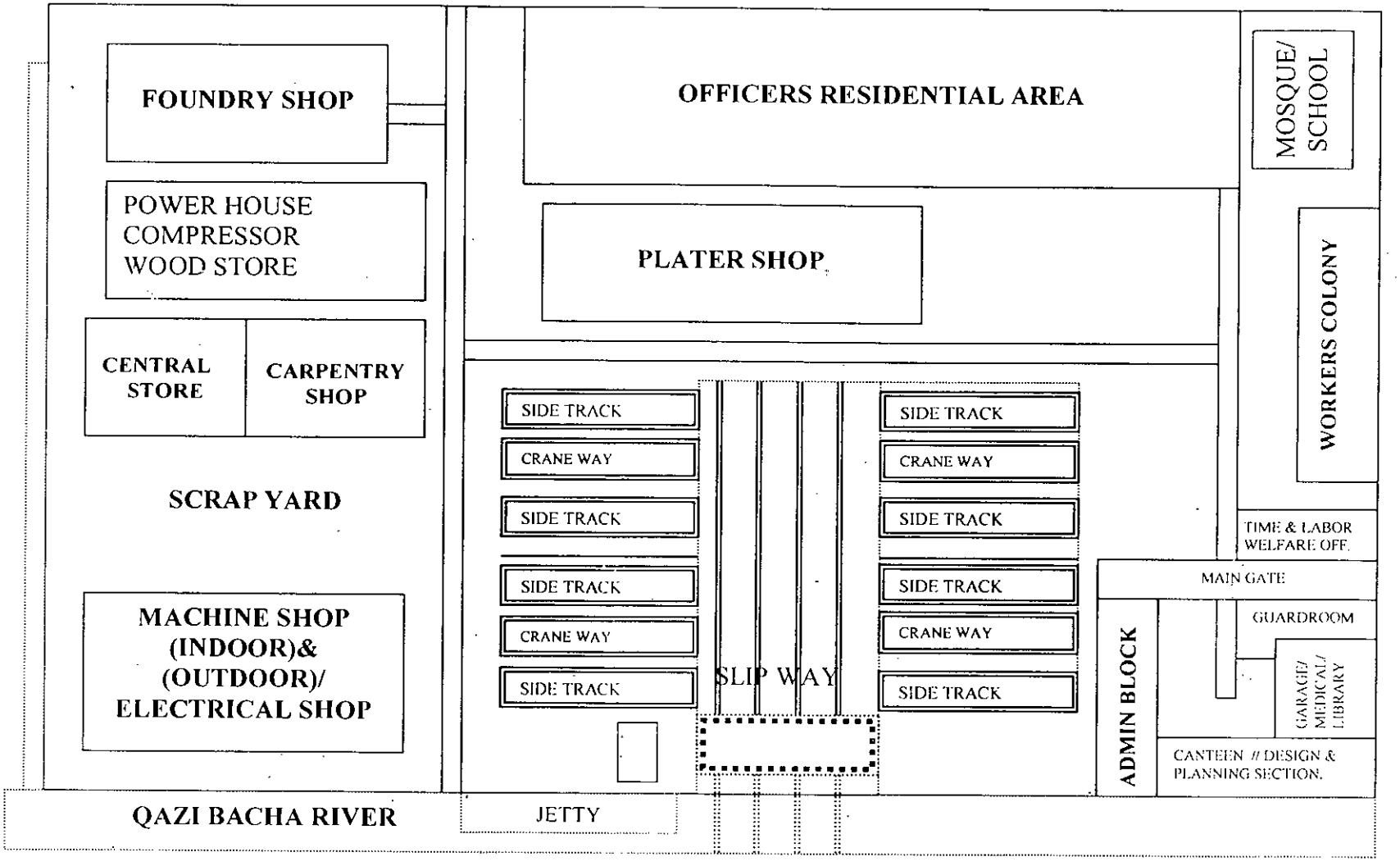


Figure: 3.1 Organogramme of Khulna Shipyard Limited

3.3 Lay-out plan of Khulna Shipyard.



3.4 PERSONNEL EMPLOYED IN KSY (AS ON JUNE 2003)

Khulna Shipyard Limited is run by almost 650 personnel of different rank, trade and grade. A brief statement of personnel employed in KSY is listed below.

Sl No.	Description	Qty
a.	Naval Officers	11
b.	Naval Personnel	18
c.	Permanent Civil Officers (Class I)	26
d.	Permanent Civil Officers (Class II)	18
e.	Permanent Civil Staff (Class III)	67
f.	Permanent Civil Staff (Class IV)	43
g.	SMT & MT	38
h.	Workers	216
i.	Casual Workers	200
j.	TOTAL	637

3.5 YARD FACILITIES

KSY has got a wide area of yard consists of 8 (eight) berths, each 325 ft. in length for Ship's berthing. A Slipway with a capacity to dock and undock vessels up to 700 ton lightweight of overall length 275ft. For berthing facilities there is 1 in no. 8 ton capacity Crane and 2in no.5 ton capacity berth cranes. There is also 1 Jetty Crane of 30 ton capacity.

3.6 WORKSHOPS OF KSY

KSY basically composed of two main categories of department such as production department and service department. Production department composed of good number of workshops. Description of major workshops, their machineries, equipments, tools, materials used, personnel employed, capacity of production and limitations are illustrated below.

3.6.1 SHIPBUILDING SHOP

Shipbuilding shop is known as plater shop. It is the major workshop of KSY. Under this workshop shipbuilding activities can be divided into tow areas, ie. preparation & fabrication facilities and Building berth. However the lifting capacity of the yard is rather limited. So block fabrication system cannot be adopted. The shop is equipped with different machineries like shearing, bending, punching, drilling, welding equipment, aluminum welding equipment etc. List of main machineries are given as:

- Universal Bending machine
- Plate edge bending machine
- Shearing and Punching machine
- Metal cutting bend saw machine
- Hydraulic bending machine capacity 500 Ton
- Radial drill machine
- Column drill machine
- Ixion high speed drilling machine
- Fly shearing machine
- Plate bending roller
- Double ended grinding machine
- Annealing furnace
- Oven with electric motor
- Auto gas cutting machine
- Metal cutting bend saw
- Air angular grinding machine
- Ultrasonic thickness indicator gage
- Ultrasonic flow detector
- Good number of oxygen, LP Gas and acetylene Cylinders
- Different welding machines
- OTC Welding Transformer
- Arc Welding Reactor (Pot Welding Transformer)
- Diesel Welding Set

- Air-cooled welding set
- Spot welding machine
- Siemens Arc welding machine

The listed machineries are operational, non-operational, and scrap type. All machineries are very old, and no preventive maintenance is carried out. Only corrective maintenance policy is followed.

Following are the few capabilities/characteristics of the equipments in the plater shop.

a. Plate that can be rolled or pressed is 3/8 in. thick and 20 ft. long.
b. Plate can be sheared is 1/2 in. thick and 10 ft. long.
c. Stiffener size that can be handled is 2 in. x 2in. X 3/8 in. x 20 ft.
d. The well-designed lofting floor of size 78 ft x 25 ft. helps to construct the ship in the finest possible way.

The sub –sections of plater shop are

a. Welding section
b. Plater section
c. Gas-cutting section
d. Machine section
e. Loft –floor and
f. Blacksmith.

Personnel employed (permanent)

Mechanical Engineer & SATO	04
Clark, MT&SMT	06
Fitter	34
Shipwright	03
Gas cutter	26
Welder	27
Machine man	07
Crane man	04
Blacksmith &Cocker man	02

Total: 113

Raw materials used and outputs:

The shop basically uses different sizes of Mild Steel (MS) plate, MS angle bar, welding electrodes, Oxygen gas, Acetylene gas, and LP gas mainly as raw material. They mainly fabricate / repair the ships hull, structure, frames and all other components of steel plate, aluminum plate.

Limitation

a. 500-ton capacity hydraulic Bending machine is considered to be one of the vital equipment of the workshop. Its performance is not up to the requirements since last few years. As a result temporary repair has been done before but the performance could not be improved as required. But it became essential to repair necessary defects completely at the earliest, otherwise the shop may face severe problem in production without 500-ton capacity hydraulic Bending machine.

b. Hand gloves are very essential item in the shop. But the supplied hand gloves are sewed with nylon, which burn very quickly just with a drop of welding flame. Thus consumption of hand gloves is very high, which can be reduced with necessary care.

c. Shortage of MIG welding machine, plasma-cutting machine.

d. Performance of oil cooled welding machines are not good, as they get overheated within short time, they need to be replaced.

3.6.2 MACHINE SHOP INDOOR

Machine Shop is equipped with wide ranging Lathe, Shaper, Planner, milling, drilling, and other machine tools necessary for day-to-day production of KSY. The list of main machineries are given below:

- BECO general purpose lathe
- DF standard lathe
- Vertical lathe
- Horizontal boring machine
- KLOP shaping
- BECO shaping

- Vertical milling
- Horizontal milling
- Planning machine
- Radial grinding machine
- Surface & Universal grinding machine
- Up-right drilling machine
- Engraving machine
- Pedestal grinding machine
- Metal cutting bend saw
- Heavy duty folding machine
- Flanging machine
- Cutting out & nobbling share machine
- Vertical hydraulic press
- Electric dynamic balancing machine
- Heavy-duty pipe bending machine
- Centrifugal re-metalling machine
- Blast metalling furnace
- 5 Tons hoisting equipment
- Zib crane
- Traveling crane overhead

The listed machineries are operational, non-operational, and scrap type. Moreover difficulty arises in case of precision works as; almost all machineries are old and lagging in self-accuracy.

Personnel employed (permanent)

Mechanical Engineer	01
SATO	01
Junior Clark, MT	02
Office Assistant	01
SMT	03
Worker (machine man &turner)	29
Total:	**37**

Raw Materials used and Capacity: Different types and sizes of MS, SS, Brass rod, shaft, plates ect are used as raw material to manufactures engineering items, different spare parts of machineries of various internal & external customers as per their requirements. Moreover machining of propeller shaft, boring of bush, trueness checking of shafts, propeller balancing are some of the examples of some specialized field of engineering works.

Limitations

- On the existing lathe machines maximum length of 27 ft shafts can be worked. But sometimes more than 27 ft long shafts are also required to work, when it becomes difficult.
- Shortage of skilled manpower in different machines.
- High precision works is difficult to carryout.
- At least one new shaper, planner and milling is essential immediately as these are very old and accuracy can not be achieved with those.

3.6.3 MACHINE SHOP OUTDOOR

Machine shop (Outdoor) normally does not manufacture rather carryout installation, maintenance and repair works.

Personnel employed (permanent)

Assistant engineer (OIC)	01
ATO	01
MT	02
SMT	04
Clark	01
Worker (Marine)	06
Worker (powerhouse)	06
Pipe fitter	11
Total:	32

Capacity of production: Machine Shop (Outdoor) usually carryout following major works.

- Ships propulsion system installation, repair and maintenance.

- Steering system installation, repair and maintenance
- Main engine and gearbox alignment
- All auxiliaries installation & repairing
- All pipe line installation & repairing and maintenance.
- Yard maintenance like mobile crane, dredger, powerhouse etc.

Limitations

- Pipe bending is done by heating, hydraulic pipe bending machine is essential.
- Shaft temperature measuring instrument is essential.
- Pipe cutting is carried out by handsaw or gas cutter, for quality work pipe cutter may be introduced.
- Pipe pressure test facilities are not available at present.

3.6.4. ELECTRICAL SECTION

Electrical shop is basically a section of the Machine shop. It is moderately equipped with man and materials. For installation and assembly works few working tools are there, but no heavy machineries are involved. It is primarily responsible for maintenance, testing and commissioning of electrical and electronic items. Insulation checking, motor & transformer winding and welding machine repairing, Battery repairs, is other facilities available. This shop is also capable of servicing and fabrication of switchboards, controllers and starters and all classes of wiring including main engine, generator control panel and cabling work for marine and industrial application. One of the special purposes of the shop is to install and commissioning of ships air conditioning and refrigeration plant, gas charging and repair of ships air conditioning and refrigeration plants, domestic refrigerators and air conditioners.

Personnel employed (permanent)

ATO	02
Senior Clark, MT& SMT	03
Worker (Marine)	18
Total:	23

Limitations:

- The shop is facing problem with motor overhauling, as there is no permanent facility of oven baking, at present a temporary cemented arrangement is there.
- Shortage of few very essential test equipments like bridge meager, high voltage meager, oscilloscope etc.
- Moreover almost no facilities available for working in Radio electrical section, which felt necessary to rise gradually.
- One permanent shop officer incharge is felt necessary.

3.6.5 CARPENTRY SHOP

Sundarban is situated just within 40 km of KSY. Abundance of timber in Sundarban has made the finest source of wood. Usually required wood is purchased through tender. Those woods are generally used by Carpentry shop to carry out the fabrication of different wooden components of the ship as well as all types of wooden furniture as required by the customer. In addition they carryout sandblasting, painting of ships, fixing paneling and also manufacturing of different canvas covers. Mostly following raw materials are used in the workshop.

a. Wood(marine Type)

- Garjan
- Sundari
- Shal
- Kerosene

b. Wood (furniture)

- Shegun
- Mehagani

c. Painting and sand blasting

- Different paints
- Thinners
- Pig Gribbles

- Shylet sand

d. Polishing

- Math elated sprit
- Powder paint
- Gala
- Chas

e. Rigging Rope, Canvas etc.

Following Machineries held in the workshop

- Heavy-duty bend saw
- Mortise machine
- Mabinate maker circular machine
- Fast radial saw machine
- Spindle shaping machine
- Electric thickness planning machine
- Heavy duty planning machine
- Planning joining machine
- Universal band sanding machine
- Floor sanding machine
- Heavy duty boring machine
- Circular saw machine
- Knife sharpening machine
- Auto saw sharpening machine
- Double disc sanding machine
- Wood drilling machine
- Electric D.E. Grinding machine
- Spray painting machine
- Spray Gun machine
- Airless spray painting machine
- Sand blasting machine
- Upright drilling machine
- Becopiller drilling machine

Limitation of the workshop

Following equipments are essential at the moment for better productivity of the workshop

- Auto screw setting machine for fixing paneling
- Carpentry Lathe
- More Spray painting machine
- Portable Crane
- Seasoning Plant

3.6.6 FOUNDRY SHOP

The shop is equipped with the facilities of Cast Iron casting of all types up to 10 tons. Various Cast Iron components like Rollers of Sugar Mills, small shafts, gears, casing of pumps and other rare items of different ships, Ingot molds for steel mills, and various equipment for power station, textile and jute mills can be produced. One of the great achievements of the shop in recent days is the manufacturing of Globe Digesters for paper mills.

Moreover the shop can also undertake different equipments like propellers, ships bells, Bearing lining and other different non-ferrous casting of Gun metal, White metal, Babbitt metal, Bronze, Aluminum etc.

The shop is equipped with the following major machineries, /equipments.

- Cupola furnace, capacity 3.5 tons
- Cupola furnace, capacity 1.5 tons (Fabricated in KSY)
- Crucible tilting furnace, capacity 500 lbs
- Portable receiver furnace
- Portable mould dryer
- Sand mixture machine, capacity 2 tons.
- Dryer sand mixing machine, capacity 1.5 tons
- Dry chamber for mold
- Overhead crane, capacity 10 tons
- Core mixing blowing machine

- Coarse sand mixing machine
- Clay mixing machine
- Graphite powder mixing machine
- Punching and shearing machine
- Column drill machine
- Short blasting machine
- Portable sand preparing machine
- Molding box of different sizes

Besides the said machineries and equipments there are good number of tools like various sizes Hammer, Spanners, Screw drivers, Allen keys, wrench, different types and sizes of spoons and shovels (used for shaping the molds). Most of them were acquired from Germany during the primary installation of the shipyard. It has been known from the user of the shop that most of the loose tools of the shop, especially those related directly with molding were not used from the beginning. At present the life of those tools are found to be from 5- 25 % for different items. Steps may be taken to ascertain the tools actually required for the shop in future and the rest tools may be disposed off as per regulation. Again few tools are found to be very essential for the shop, which can be purchased and supplied in the shop.

Limitations:

i.) Initially total Manpower of the shop was about 85 but gradually it decreases to 12 at present. Most of them have retired and some others were transferred to other department like security, as the shop is running almost idle for long. Majority of the personnel are illiterate but have long working experience. One major shortcoming of the shop has been felt that there is only one ATO, acting as the incharge of the shop who is only educated and technically sound on foundry. But there is no one to replace him at present in the shop and the incharge is supposed to retire in next year. As the molding works are not very easy and it requires lot of experience to complete defect free mould in the first chance. So, producing replacement of the said ATO is felt very essential.

ii.) One induction furnace is very essential

iii) No testing lab facilities like metal composition test, hardness test, compressive test, tensile test ect.

iv) Necessary facilities for surface treatment, electroplating, galvanizing is essential.

v) Few of the requirements are fulfilled by some innovative ideas, which cost money and time.

3.6.7 CIVIL ENGINEERING SHOP

All sorts of cement & R. C. C work and various tiles fitting as per customers' needs are carried out by this department. Moreover this department also carries out building and other concerned internal necessary maintenance works.

3.6.8 DESIGN AND PLANNING:

This department is considered to be the most important department in KSY. Because the department is responsible for providing necessary drawing & documentation for new project/ construction as well as all modification works. They also perform the initial estimation works, compilation works of filling all tender forms & Quality assurance measures are also ensured by this department.

3.6.9 LABOR WELFARE OFFICE

Labor Welfare Office performs all sorts of tasks related to the workers. Major tasks are outlined below:

a. Labor Welfare Office provides the casual labor as per requirement of the workshops through the contractor. The contractor is selected for one year through Tender.

b. For the Permanent labor they carryout recruitment, internal transfers, discharge, dismiss, termination, retirement, wage determination, promotion, yearly increment, working dress supply, personal documents maintain and preservation, service book maintain, leave related all works, attendance register maintain, distribution of few residence among the workers according to roaster, recreational activities, training of workers and all other works related to the

workers.

3.6.10 MEDICAL CERTRE

There is a medical center in KSY consisting one MBBS Doctor and four other staffs. They always gives service in accidents and also for normal patients. The system is a bit different depending on the situation.

All the permanent workers and all other employees are authorized to get first aid treatment and medicine for any accidents during working in the concerned fields.

All the casual workers are authorized to get only first aid treatment but no expenditure of medicine is borne by KSY for accidents during working in the concerned fields. Otherwise for all other normal patients the doctor prescribes the medicine and that is to be purchased by the individual at his own cost from outside pharmacy. In case of major accidents while working, victims used to get full free treatment. They also maintain the Medical Leave for workers up to 14 days with full payment, and beyond that if required without payment.

3.6 COMPARISON DATA OF OUTPUT IN DIFFERENT SECTORS.

Statistics of yearly actual production in different sectors & delivery to customers for the preceding few years are shown in the following table.

Description	July 2001to June 2002	July 2000to June 2001	July 1999 to June 2000	July 1998to June 1999
New building	53%	33.4%	41.4%	71.6%
Repair	34.5%	59.1%	54.6%	26.3%
Foundry, Manufact.and miscellaneous.	12.5%	7.5%	4%	2.1%
Total	100%	100%	100%	100%

3.8 IDLE MANHOUR STATISTICS

Idle man-hour is produced due to various environmental and other reasons. A list of idle man-hour produced in the preceding few years are illustrated in the following table. It is to be mentioned that **data for the year July 2001 to June**

2002 is not available for the complete year.

Sl. No.	**Description**	Fr. July 2001 to June 2002 man-hour	Fr. July 2000 to June 2001 man-hour	Fr.July 1999 to Jun 2000 man-hour	Fr. July 1998 to June 1999 man-hour
A.	Power disruption	1516	11316	20030	39332
B.	Heavy Rainfall	1055	4544	5370	6099
C	Shortage of raw material	-	-	877	33968
D.	Shortage of works	--	2104	24339	70804
E	Machinery defects	3	550	345	-
F.	Total	2574 man-hour	18514 man-hour	50961man-hour	150203man-hour

3.9 COMPARISON OF PERSONNEL EMPLOED IN THREE PERIODS

A list of personnel employed in three periods (during Pakistan period, during BSEC control period and present period)is shown in the following table.

Sl. No.	Description	During Pakistan Period	During BSEC Control [Kabir, 1985]	Present Strength
A.	Plater Shop	**Data not available**	334	112
B.	Docking section		25	24
C.	Machine shop (indoor)		81	37
D.	Machine shop (outdoor)		61	33
E.	Carpentry shop		101	25
F	Electrical shop		41	24
G.	Foundry shop		58	13
H.	Main store		7	15
I.	Maintenance and civil engineering		39	21
j.	Office staff		315	91
K.	Management		122	42
L	Total		1184	437

3.10 ELECTRICITY CONSUMPTION: Electricity is the vital factor for

production in KSY. KSY is run by the electricity supplied by PDB.A typical load consumption breakdown as shown in the following table.

Load consumption chart

Sl no	Description	Average Consumption (KW)	Maximum Consumption (KW)
a.	Machine shop	52	223
b.	Foundry shop	20	88
c.	Carpentry shop	35	88
d.	Platter shop	90	750
e.	Berth crane	40	135
f.	Power house	80	90
g.	Slipway, Fresh Water, Seawater	135	140
h.	Yard light	8	20
i.	0fficer's colony	10	165
j.	Labor colony	10	25
k.	Admin wing	10	20
l.	Total consumption	490 KW	1744KW

Generator No : 1

Output Voltage: 415 /440 Volts

Output Power: 256KW

Frequency: 50 Hz Phase: 3Φ

Power Factor: 0.8 (Lagging)

Generator No: 2

Output Voltage: 415 /440 Volts

Output Power: 413 KW

Frequency: 50 Hz Phase: 3Φ

Power Factor: 0.8 (Lagging)

3.11PRODUCTS OF KSY

Khulna Shipyard can construct/ fabricate following different products, and also many more.

a. Inland and Coastal Work boats.
b. Harbor, Coastal and Seagoing Tugs.
c. Pusher Tugs and Barges.
d. Ferries, Landing Craft, Crane Barges.
e. Hydrographic Survey Vessels,
f. Buoy Handling Vessels.

g. Utility and Offshore Supply Vessels.
h. Pilot Boats; Fire fighting Vessels, Search and Rescue Boats.
i. Crew Boats and Fast Ferries.
j. High Speed Patrol Boats.
k. Dredgers.
l. Fishing Vessels
m. Cargo vessels and Tankers.
n. Pontoons
o. Design & fabrication of chimney, Hot and cold ducts.
p. Design & fabrication of oil tanks.
q. Fabrication of steel structure and pipes.

3.12 CUSTOMERS OF KSY

Usually Khulna Shipyard serves a variety of customers, such as:

a. Dredging companies
b. Shipping companies
c. Oil companies
d. Offshore service companies
e. Port authorities
f. Defense forces
g. Coast guards
h. Fishing companies
i. Sugar mills
j. Paper mills.
k. Spinning mills
l. Inland water transport companies.
m. Power Development Board etc

CHAPTER 4

QUALITY PROFILE OF KSY

4.1 INTRODUCTION

The word Quality is a relative entity. There is no unit to measure it, but it can be defined as, "The degree to which a product meets the requirements of a customer ". In other words "The fitness of a product or service for its intended use" is quality. So, the concept of quality does not always means costly. Actually Quality is a multifaceted entity, having at least eight dimensions:

a. Performance
b. Reliability
c. Durability
d. Serviceability
e. Aesthetics
f. Features
g. Perceived quality
h. Conformance to standards [Douglas,1990]

The quality control conveys an idea about determining and maintaining that quality of product or service, which will satisfy the customer by its performance; cost, delivery, reliability etc. Customer satisfaction is therefore the key to effective quality assurance. Because an item, even it produced to a level of quality higher than that demanded by the customer will not be appreciated if its cost is too high or if it is delivered too late. It is not simply a question of controlling the quality of product as it rolls out from the production lines, but more so, it has become necessary to manage the quality of the entire system responsible for manufacturing the product. This system is composed of materials, machines and manpower as the three vital resources. Quality of every resources has to be ensured at every stage, right from the product design, planning, material handling, material processing, production, delivery to the last stage of product performance at the customer's premises. To be competitive in the market, the motto of a producer is to be "to

produce at the first time, every time, on time and at a cost reasonable to the customer."

4.2 BACKGROUND OF QUALITY CONTROL

If we look back into the history of human evolution, it will be observed that quality has always been integrated into the development of human society. It is quite possible that ancient builders and artisans were more skilled and quality – conscious than what we profess to be today. However, quality was confined to manual skills, workmanship and proficiency. The entire work of building houses, halls, temples, producing agricultural implements, as well as arms and ammunition was taken as a matter of art. In the period before the industrial revolution of Europe, the entire manufacturing activity was carried out by the cottage industry spread over villages and remote areas away from large towns, which relied heavily on the craftsmen. The craftsmen in turn trained apprentices thoroughly who later took over their positions. Thus, skills and quality were passed on from one generation to the next.This trend is still very much evident in various trades which are dominated by specific communities such as textile dyeing and printing for hand loom cloth, lock smithy, statue making, sculpturing, wood work etc.

With the advent of the industrial revolution, manufacturing was broken up into small parts. Craftsmen became inspectors and standards started to emerge. Thus gradually three or four classes of workmen were formed; the highly skilled, skilled, semi-skilled and un-skilled. The two world wars demanded a further expansion in manufacturing. Mass production methods of manufacturing were developed in all areas of engineering and technology. Mechanization and later automation were introduced for faster production. With these changes the demand for skills reduced and industries relied more on inspectors to ensure quality of the product.

In 1924,W.A. Shewhart of Bell Telephone Laboratories developed a statistical chart for the control of product variables. This chart is considered to be the beginning of statistical quality control. Later during and after Second World War.

statistical quality control became an essential technique to assist in quality control and production. The era of 'Quality control' changed to 'Quality assurance'. Deming and Juran contributed to a large extent in the late forties by introducing statistical practices and ushering in the modern concept of quality assurance.

In the early fifties, K.Ishikawa introduced a new technique of worker motivation for improving quality and called it 'Quality circles'. Training tools like cause and effect diagram and Pareto analysis were used. The 'zero defect' concept and 'right first time' concepts were introduced in the west at the same time. The emphasis on the inspection of the final product to achieve the desired quality was shifted to controlling quality at every stage of production and thus, the term 'total quality control' was introduced by Fiegenbaum in the year 1983, which was later changed to 'total quality management'.[Jain,2001]

4.3 QUALITY PROFILE IN KSY

From the inception of KSY till today there is no separate Quality control department. As mentioned in previous section 'the skills and quality were passed on from one generation to the next', the same principal is very much applicable for KSY also. One of the basic limitations lies there that most of the workers were recruited in early 1980s. Maximum of them are basically illiterate, they can hardly write their name and address. On the other hand they are very good as technician in their practical works. So, KSY could achieve the reputation of good quality working capability. From the beginning the quality of the raw materials were checked by the user department and the quality of the finished product used to be checked by the Design & Planning department. Same practice continued after taken over by BN also. Recently top management felt the necessity of a separate quality control department. In line of that one quality control team consisting of five members (senior rating and experienced) from plater, carpentry, and machine shop has been introduced one year back. Even the terms and conditions and responsibilities of the Quality control team is not well defined. The experienced work force has already started to retire and will come to end within next few years. On the other hand KSY use to carry out training programme for the students of

other organizations periodically, but for their own there is no arrangement of formal training, seminar, symposium or even quality awareness motivation lecture. Behind that the intention is, the quality of works of KSY is very good and do not require such training. Moreover during working hour to conduct formal training in lieu of normal working is hampering of production. And the concept of quality is still in the area of check/inspection of end /finished product. For the engineers there was an arrangement of training in foreign countries, which has been stopped few years back as the financial condition of KSY turned in loosing state. Moreover from customer point of view it is found that one of the groups is not interested to put any work order at KSY due to delayed delivery works, and high cost of production. So, there is lot of scope to highlight on how proper Quality management techniques increases productivity and decreases cost.

4.4 THE DEMING CYCLE

The Deming cycle was developed to link the production of a product with

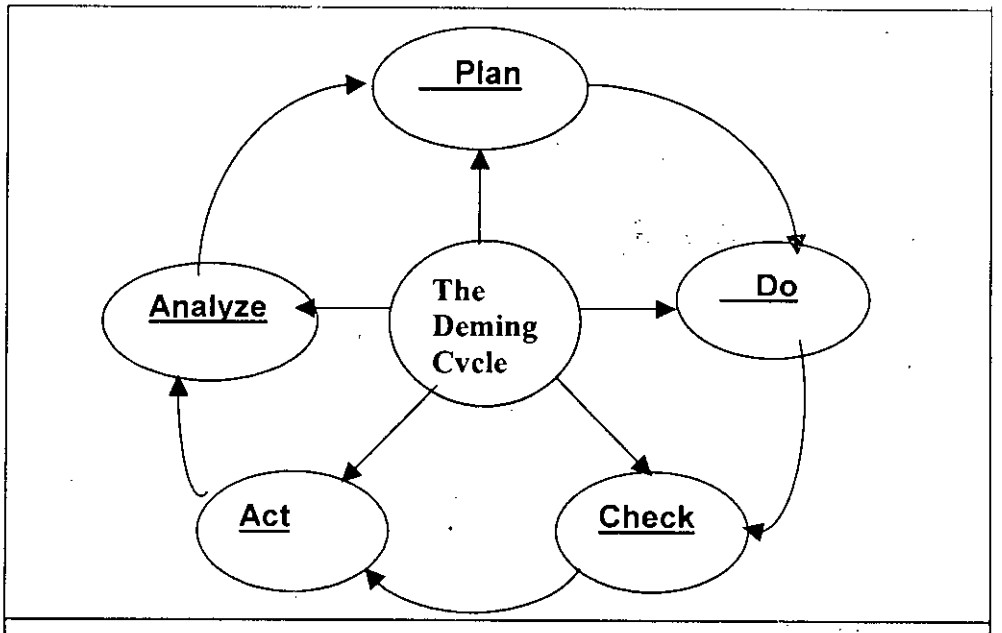


Figure 4-1 The Deming Cycle

consumer needs and focusing the resources of all departments (research, design, production, marketing) in a cooperative effort to meet those needs. The Deming cycle proceeds as follows:

a) Conduct consumer research and use it in planning the product (plan).

b) Produce the product (do).

c) Check the product to make sure it was produced in accordance with the plan (check).

d) Market the product (act).

e) Analyze how the product is received in the marketplace in terms of quality, cost, and other criteria (analyze)

Deming's philosophy is both summarized and operationalized by his fourteen points. [Goetsch,1997]

4.5 APPLICATION OF THE DEMING'S PHILOSOPHY AT KSY.

Dr. Deming is credited with providing the foundation of the Japanese quality miracle and resurgence as an economic power. He developed 14 points as a theory for management for improvement of quality, productivity, and competitive position. Those points may be an important breakthrough for KSY in improving quality and productivity. In that view those 14 points are illustrated below:

a. Create and Publish the Aims and Purposes of the Organization

Management must demonstrate constantly their commitment to this statement. It must include investors, Customers, suppliers, employees, the community, and a quality philosophy. The statement is a forever- changing document that requires input from everyone. Organizations must develop a long-term view of at least ten years and plan to stay in business by setting long-range goals. Resources must be allocated for research, training, and continuing education to achieve the goals. Innovation is promoted to ensure that the product or service does not become obsolete. A family organizational philosophy is developed to send the message that everyone is part of the organization.

b. Learn the New Philosophy

Top management and everyone must learn the new philosophy. Organizations must seek never-ending improvement and refuse to accept nonconformance. Customer satisfaction is the number one priority, because dissatisfied customers will not continue to purchase nonconforming products and services. The organization must concentrate on defect prevention rather than defect detection. By improving the process, the quality and productivity will improve.

Everyone in the organization, including the union, must be involved in the quality journey and change his or her attitude about quality. The supplier must be helped to improve quality by requiring statistical evidence of conformance and shared information relative to customer expectations.

c. Understand the Purpose of Inspection

Management must understand that the purpose of inspection is to improve the process and reduce its cost, for the most part, mass inspection is costly and unreliable. Where appropriate, it should be replaced by never-ending improvement using statistical techniques. Statistical evidence is required of self and supplier. Every effort should be made to reduce and then eliminate acceptance sampling. Mass inspection is managing for failure and defect prevention is managing for success.

d. Stop Awarding Business Based on Price Alone

The organization must stop awarding business based on the low bid, because price has no meaning without quality. The goal is to have single suppliers for each item to develop a long-term relationship of loyalty and trust, thereby providing improved products and services. Purchasing agents must be trained in statistical process control and require it from suppliers. They must follow the materials throughout the entire life cycle in order to examine how customer expectations are affected and provide feedback to the supplier regarding the quality.

e. Improve Constantly and Forever the System

Management must take more responsibility for problems by actively finding and correcting problems so that quality and productivity are continually and permanently improved and costs are reduced. The focus is on preventing problems before they happen. Variation is expected, but there must be a continual striving for its reduction using control charts. Responsibilities are assigned to teams to remove the causes of problems and continually improve the process.

f. Institute Training

Each employee must be oriented to the organization's philosophy of

commitment to never-ending improvements. Management must allocate resources to train employees to perform their jobs in the best manner possible. Everyone should be trained in statistical methods, and these methods should be used to monitor the need for further training.

g. Teach and Institute Leadership

Improving supervision is management's responsibility. They must provide supervisors with training in statistical methods and these 14 points so the new philosophy can be implemented, instead of focusing on a negative, faultfinding atmosphere. Supervisors should create a positive, supportive one where pride in workmanship can flourish. All communication must be clear from top management to supervisors to operators.

h. Drive out Fear, Create Trust, and Create a Climate for Innovation

Management must encourage open, effective communication and teamwork. Fear is caused by a general feeling of being powerless to control important aspects of one's life. It is caused by a lack of job security, possible physical harm, performance appraisals ignorance of organization goals, poor supervision, and not knowing the job. Driving fear out of the workplace involves managing for success. Management can begin by providing workers with adequate training, good supervision, and proper tools to do the job, as well as removing physical dangers. When people are treated with dignity, fear can be eliminated and people will work for the general good of the organization. In this climate, they will provide ideas for improvement.

i. Optimize the Efforts of teams, Groups, and Staff Areas

Management must optimize the efforts of teams, work group, and staff areas to achieve the aims and purposes of the organization. Barriers exist internally among levels of management. Among departments, within departments, and among shifts. Externally, they exist between the organization and its customers and suppliers. These barriers exist because of poor communication, ignorance of the organization's mission, competition, fear, and personal grudges or jealousies. To break down the barriers, management will need a long-term perspective. All the different areas must work together. Attitudes need to be

changed: communication channels opened; project teams organized; and training in teamwork implemented. Multifunctional teams, such as used in concurrent engineering, are an excellent method.

j. Eliminate Exhortation for the Work Force

Exhortations that ask for increased productivity without providing specific improvement methods can handicap an organization. They do nothing but express management's desires. They do not produce a better product or service. Because the committed to the long-term success of the organization. Improvements in the process cannot be made unless the tools and methods are available.

k.(i). Eliminate Exhortations for the work Force

Instead of quotas, management must learn and institute methods for improvement. Quotas and work standards focus on quantity rather than quality. They encourage poor workmanship in order to meet their quotas. Quotas should be replaced with statistical methods of process control. Management must provide and implement a strategy for never-ending improvements and work with the force to reflect the new policies.

k(ii). Eliminate Management by Objective

Instead of management by objective, management must learn the capabilities of the processes and how to improve them. Internal goals set by management, without a method, are a burlesque. Management by numerical goal is an attempt to manage without knowledge of what to do.

l. Remove Barriers That Rob People of Pride Workmanship

Loss of pride in workmanship exists throughout organization because (1) workers do not know how to relate to the organization's mission,(2) they are being blamed for system problems, (3) poor designs lead to the production of "junk," (4) inadequate training is provided, (5) punitive supervision exists, and (6)inadequate or ineffective equipment is provided for performing the required work. Restoring pride will require a long-term commitment by management. When works are proud of their work. They will grow to the fullest extent of their job. Management must give employees operational job descriptions,

provide the proper tools and materials, and stress the workers understanding of their role in the total process. By restoring pride everyone in the organization will be working for the common good. A barrier for people on salary is the annual rating of performance.

m. Encourage Education and Self-Improvement for Everyone

What an organization needs is people who are improving with education. A long-term commitment to continuously train and educate people must be made by management. Deming's 14 points and the organization's mission should be the foundation of the education program. Everyone should be retrained as the organization requirements change to meet the changing environment.

n. Take Action to Accomplish the Transformation

Management has to accept the primary responsibility for the never-ending improvement of the process. It has to create a corporate structure to implement the philosophy a cultural change is required from the previous "business as usual" attitude. Management must be committed, involved, and accessible if the organization is to succeed in implementing the new philosophy.[Besterfield,1999].

4.6 QUALITY COSTS

The quality and cost of a product is very closed linked. Better the quality, greater would be its cost of production. For instance, reasons are better quality of raw material used, higher degree of skills required and greater cost incurred in controlling or improving quality. All the cost elements which affect the total cost of maintaining and controlling quality can be grouped together as 'quality costs 'or 'cost of quality.' There are four categories of quality costs:

a. Prevention costs
b. Appraisal costs
c. Internal failure costs and
d. External failure costs

a. **Prevention costs**

Prevention costs are those costs associated with efforts in design and

manufacturing that are directed toward the prevention of nonconformance. That is to 'make the product right the first time.

b. **Appraisal costs**

Appraisal costs are those costs associated with inspection, measuring, evaluating or auditing products, components, and purchased materials to ensure conformance to the standards that have been imposed.

c. **Internal failure costs**

Internal failure costs are incurred when products, components, materials and services fail to meet quality requirements, and this failure is discovered prior to delivery of the product to the customer. These costs would disappear if there were no defects in the product.

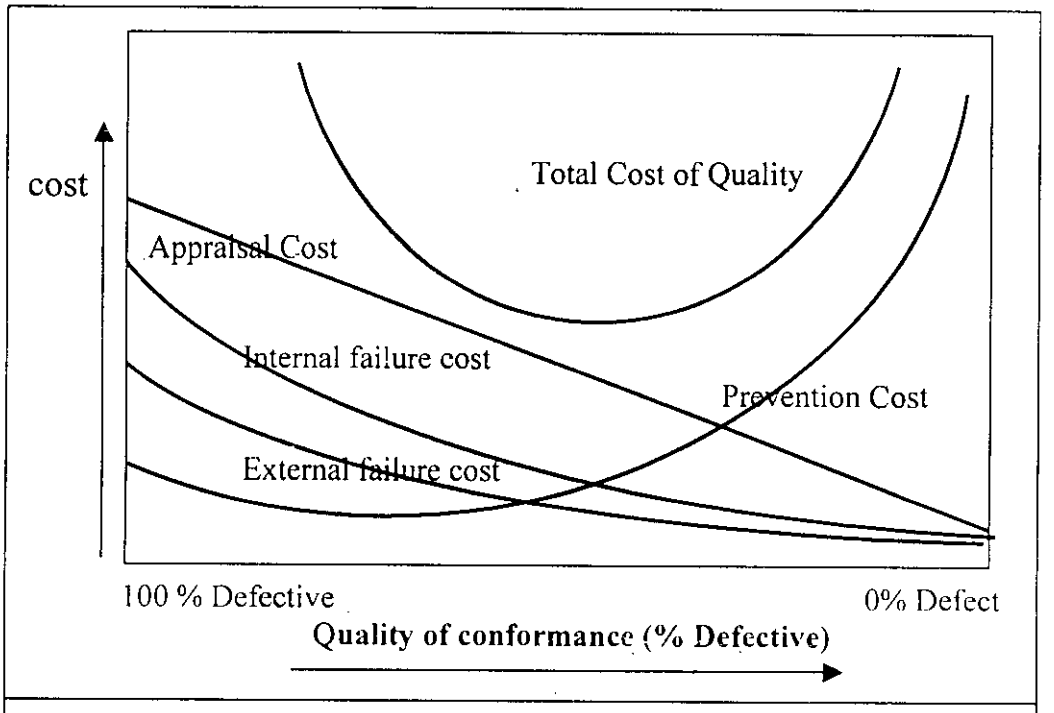


Figure:4.2 Quality versus Cost Relationship

d.External failure costs

External failure costs occur when the product does not perform satisfactorily after it is supplied to the customer. These costs would also disappear if every unit of product conformed to requirements. [Jain2001,& Douglas1990]

CHAPTER FIVE

IMPLEMENTATION OF ISO IN KSY

5.1 EVOLUTIONS AND HISTORY

The ISO 9000 concept was born in 1958 by US Military as MIL-Q-9858, later it was revised in 1963. In 1968 NATO adopted the concept as AQAP-1.Later on U.K. Defense Standard in 1970-73 and U.K.British Standard BS 5179 in 1974 superseded it. By this time QA Systems developed. In 1979 BS 5750 was developed, followed by TC176:ISO in 1983. In 1987 the first set of standards was published and adopted by International Organization for Standardization (ISO). A revision of this standard was made in 1994 on the basis of worldwide experience gained through implementation. Another major revision to the 1994 version was made in November 2000. And the revised version, which is known as ISO9000: 2000 was published as standard in February2001.

5.2 ISO 9000, WHAT DOES IT MEAN?

The term, ISO was adopted by the International Organization for Standardization (ISO), from a Greek word, *isos*, meaning equal and /or uniform, in order to establish a uniform standard for a wide range of functions and activities. In order to mean uniformity, the IOS was deliberately transformed to ISO.ISO 9000 in the world today is defined to be a set of standards created and published by ISO. [Hasin, 2001].

The standard describes and defines the Basic Elements of the system needed to ensure that a company's products and or a facility's services meet or exceed customer's need and expectations. It is a group of generic standards, which spell out clearly what should be a company's quality system regardless of its nature. ISO is not only doing what you say you do and documenting it, but also really doing what you claim you do, all the time. ISO 9000thus ensures that you say what you do and do what you say.

5.3 OBJECTIVES OF ISO 9000

To provide confidence to customers and stakeholders that quality requirements are achieved in product, consistent with professional standard, ethics and excellence.To create and on a continuous basis, to improve the means by which the organization meets customers stated

and implied needs, leading to customer satisfaction and in success for the enterprise.

5.4 HOW DOES THE SERIES WORK?

The ISO series provides the users with guidelines for selection and use of ISO9001, 9002 and 9003. ISO 9001,9002 and 9003 are Quality system models for External Quality and Assurance. Of the three, ISO 9001 is the most comprehensive covering Design, Development, Production, Installation and Servicing Systems. ISO 9002 covers only Procurement, Production, Installation and servicing. Both standards require the same degree of conformance to their respective scope of activity. In the new ISO 9000:2000 version there is only one standard, ISO 9001. Almost all the requirements of the previous standards of ISO 9001, 9002, and 9003 are there in the new ISO9001 standard along with some stringent new requirements.

5.5 IMPORTANCE OF ISO CERTIFICATION

ISO 9000 is more than just a standard. It reflects a well–organized operation with trained, motivated and committed people. It is the challenge. ISO certification will advise one about creating a sound business, one that will satisfy one's customers. ISO9000 is one of the tools that can be used in the TQM (Total Quality Management) journey. The certificate is the seal of approval that makes the customers feel better when they do business. At present customers use the certification as a means of evaluation [QIA].

5.6 IMPLEMENTATION PROCEDURE

The ISO 9000 system is designed as simple system that can be used by construction. engineering, health care, legal, and other professional services as well as the manufacturing industries. There are number of steps to implement a Quality Management System.[Besterfield,1999]

a. **Senior Management Commitment:** The most important step in implementing a quality system is to acquire the full support of top management. The chief executive officer (CEO) must be willing to commit the resources necessary to achieve certification. This is most critical to the success of the project.

b. **Appointment of Management Representative:** Once the commitment has been made, the process can proceed by adopting a project team approach. The next step is to appoint a management representative who will be able to ensure that the quality system is effectively implemented and maintained irrespective of other responsibilities. This

person is responsible for coordinating the implementation and maintenance of the quality system and is the contract person for all parties involved in the process, both internal and external.

c. **Awareness:** The awareness among every member of the organization is required to grow as it is going to affect every member of the organizations as well as their input. Moreover they need to know how it will affect day-to-day operations and the potential benefits. This information can be relayed through short, two-hour awareness training program.

d. **Appointment of an implementation Team:** When every member of the organization became aware of the intentions to develop the quality system, an implementation team from all areas and levels of the organization is to be formed.

e. **Training:** The implementation team, supervisors, and internal audit team should be trained. This activity can be accomplished by sending team leaders for training and having them train

f. **Time schedule:** A time schedule for implementing the system and registration is to be developed which may be about 18 months or so.

g. **Selection of element owners:** The implementation team will select owners for each of the system elements. Owners may be assigned more than one element. Each owner has the option of selecting a team to assist in the process.

h. **Review the present system:** Existing quality system is to be reviewed. Copies of all the quality manuals, procedures, work instructions, and forms presently in use are to be sorted to determine what is available and what is needed to complete the system. This activity is known as gap analysis, which can be performed by the element owners and their teams or by an external consultant.

i. **Writing the documents:** Quality policy and procedure manuals are to be written. To maintain the quality of specific functions appropriate work instructions is to be written.

j. **Installing the new system: Policies**, procedures, and instructions into the day-to-day workings of the organization and documents to be integrated.

K. **Internal audit:** Internal audit of the quality system is to be conducted to ensure that the system is working effectively and also to provide the information's to the management for the comprehensive management review.

l. **Management review:** Management review is to be carried out to determine the effectiveness of the system in achieving the stated quality goals.

m. **Preassessment :** In the previous steps if good job is accomplished, then this step is not mandatory.

n. **Registration:** An accredited registrar company is to be hired by the company seeking registration to examine its system, processes, procedures, Quality Manual and related items. If everything is in order, registration will be granted. Otherwise the registrar will inform the company of which areas require work (but will not inform the company specially what must be done), and a second visit will be scheduled. [Goetsch, 1997].

5.7 ADVANTAGES AND BENEFITS OF ISO CERTIFICATION

The primary objective of implementing an effective quality management system is to enhance the productivity of an industrial manufacturer and the quality of its products/services. Suppliers are also benefited, because it enables them to achieve customer's satisfaction in a cost-effective way. Effective quality management systems of an organization bring the following benefits to its customers.

a. It enables them to identify and plan tasks and their method of performance with a view to yield good results.
b. It provides the means of identifying and resolving problems and suggesting their recovery.
c. It provides a means of documenting company's experiences. It can serve as the basis of training staff for improving their performances.
d. It provides a basis continual improvement in the process, improves delivery, increase speed and at the same time it decreases the cost of production.
e. It generates objective evidences to demonstrate the quality of products and the effectiveness of the system and thus builds confidence among customers.
f. It improves the image, credibility, and acceptability of an organization in the industrial business market, and boosts up export development.
g. Finally it provides an increased market share.[QIA]

5.8. QUALITY MANAGEMENT SYSTEM

To develop the Quality Manual for KSY following steps to be complied in light of the clauses 4 to 8 of ISO 9001:2000.

[The section 5.8 to 5.12 complies with the requirements under clause 4 to 8 of ISO 9001:2000.]

5.8.1 General requirements

The organization shall establish, document, implement and maintain a quality management system and continue improve its effectiveness in accordance with the requirements of this International Standard. The organization shall

a. Identify the processes needed for the quality management system and their application throughout organization.

b. Determine the sequence and interaction of these processes.

c. Determine criteria and methods needed to ensure that both the operation and control of these process are effective.

d. Ensure the availability of resources and information necessary to support the operation and monitoring of processes.

e. Monitor, measure and analyze these processes, and

f. Implement actions necessary to achieve planned results and continual improvement of these processes.

5.8.2 Documentation requirements

5.8.2.1 General

The quality management system documentation shall include

a. Documented statements of a quality policy and quality objectives,

b. A quality manual,

c. Documented procedures required by this international standard.

d. Documents needed by the organization to ensure the effective planning operation and control of its processes and

e. Records required by this international standard.

5.8.2.2 **Quality manual**

The organization shall establish and maintain a quality manual that includes

a. The scope of the quality management system, including details

b. of and justification for any exclusions

c. The documented procedures established for the quality management sy or reference to them, and

d. Description of the interaction between the processes of the qı management system.

5.8.2.3 **Control of documents**

Documents required by the quality management system shall be controlled. Recorc a special type of document and shall be controlled according to the requirements

A documented procedure shall be established to define the controls needed

a. To approve documents for adequacy prior to issue.

b. To review the update as necessary and re-approve documents.

c. To ensure that changes and the current revision status of documents are identified.

d. To ensure that relevant versions of applicable documents are available at points of use

f. To ensure the documents remain legible and readily identifiable.

g. To ensure that documents of external origin are identified and the distribution controlled, and

h. To prevent the unintended use of obsolete documents, and to apply suitable identification to them if they are retained for any purpose.

5.8.2.4 Control of records

Records shall be established and maintained to provide evidence of conformity to requirements and of the effective operation of the quality management system. Records shall remain legible, readily identifiable and retrievable. A docum procedure shall be established to define the controls needed for the identific storage, protection, retrieval, retention time and disposition of records

5.9 MANAGEMENT RESPONSIBILITY

5.9.1 Management commitment

Top management shall provide evidence of its commitment and implementation of the quality management system and continually improving its effectiveness by

a. Communicating to the organization the importance of meeting customer as well as statutory and regulatory requirements.
b. Establishing the quality policy.
c. Ensuring that quality objectives are established.
d. Conducting management reviews, and
e. Ensuring the availability of resources

5.9.2 Customer focus

The management shall ensure that customer requirements are determined and are met with the aim of enhancing customer satisfaction.

5.9.3 Quality policy

The management shall ensure that the quality policy

a. Is appropriate to the purpose of the organization
b. Includes a commitment to comply with requirements and continually improve the effectiveness of the quality management system.

c. Provides a framework for establishing and reviewing quality objectives.

d. Is communicated and understood within the organization

e. Is reviewed for continuing suitability.

5.9.4 Planning

5.9.4.1Quality objectives

Top management shall ensure that quality objectives, including those needed to requirements for product are established at relevant functions and levels withi organization. The quality objectives shall be measurable and consistent with the q policy.

5.9.4.2Quality management system planning

The management shall ensure that

a. The planning of the quality management system is carried out in order to the requirements given in 4.1 as well as the quality objectives, and

b. The integrity of the quality management system is maintained when ch to the quality management system are planned and implemented.

5.9.5 Responsibility, Authority And Communication

5.9.5.1Responsibility and authority

Top management shall ensure that responsibilities and authorities are defined communicated within the organization. The Managing Director (MD) is to contin review the company's resources to ensure that adequate staff, equipment, material other resources are available to meet customer requirements. The MD is to re committed to ISO9000 requirements, and defines policies. All staffs are to be allo with authority to perform their allocated responsibilities. The following provi summary of the principal responsibilities of each job.

Managing Director(MD)

- Administer the over-all management of the company
- Establish over-all company policy
- Keep track of the progress of over-all activities of the company,
- Approve and provide necessary resources,
- Approve the Quality System.

Quality Management Representative (QMR)

- Initiate ISO9000 project,
- Control the execution of the project,
- Write documents along with corresponding department employees,
- Control quality records,
- Arrange internal audit,
- Supervise internal team,
- Organize external assessment for certification,
- Prepare quality reports for management review,
- Organize management review meetings.

All General Managers in general

- Maintain communication with other departments for coordination,
- Verify different implementations of solutions,
- Implement quality system effectively,
- Organize and solve motivation events and issues,
- Initiate actions to prevent non-conformity in the corresponding/related section of quality system,

- Identify and record problem areas,
- Initiate improvement activities, and recommend to higher administration,
- Control non-conforming products and services in the area until solution.

General Manager Production

- Process production order,
- Schedule production order,
- Monitor machine performance and capacity,
- Control materials in the shop,
- Maintain work –in –process inventory,
- Control non-conforming products in the shop,
- Coordinate with maintenance/ technical and QC department.

General Manager Administration

- Define organization structure in accordance with the advice of MD.
- Arrange recruitment, and personnel benefits,
- Maintain personnel data,
- Welfare of employees,
- Organize training for the employees.

General Manager Design & Planning

- New product Identification & Evaluation,
- Control the measuring, monitoring, and test equipment,
- Calibration of equipment,
- Advise QC, design, technical departments on request.
- Maintain link with production manager,
- Supervise service quotations,
- Review contract, and pass to production manager for order processing
- Recommend necessity for plant expansion, recommend for training.

Deputy General Manager Finance

- Control of Finance and Accounts,
- Budget planning and control
- General management& co-ordination support functions,
- Government and external organizational relations,
- Sales Order Processing
- Organizational planning.

Quality Control Manager

- Plan for Statistical Quality Control (SQC) techniques,
- Train up employees on SQC,
- Apply Statistical Process Control (SPC) to improve production process.
- Collect and analyze sample from production,
- Work as quality Management Representative

Deputy General Manager Administration

- Receive, store, and retrieve raw materials, finished goods, and other material
- Identify material requirements, and initiate purchase request,
- Monitor inventory level, and maintain computerized inventory data.
- Process all purchase request,
- Maintain vendor relations and data

Manager Maintenance

- Monitoring machine/equipment's performance
- Project Management
- Installation, Inspection, Test & Maintenance requirements
- System design,
- Identify technical training requirements

5.9.5.2Management representative

Top management shall appoint a member of management who, irrespective of responsibilities, shall have responsibility and authority that includes

a. Ensuring the processes needed for the quality management system established, implemented and maintained.
b. Reporting to the top management on the performance of the qu management system and any need for improvement and
c. Ensuring the promotion of awareness of customer requirements throu the organization.

5.9.5.3 Internal communication

Top management shall ensure that appropriate communication processes are establ within the organization and the communication takes place regarding the effectiv of the quality management system.

5.9.6 Management review

5.9.6.1General

Top management shall review the organization's quality management syster planned intervals, to ensure its continuing suitability, adequacy and effectiveness. review shall include assessing opportunities for improvement and the need for ch to the quality management system, including the quality policy and quality objective

5.9.6.2Review input

The input to management review shall include information on

a. Results of audits,
b. Customer feedback,
c. Process performance and product conformity
d. Status of preventive and corrective actions

e. Follow-up actions from previous management review

f. Changes that could affect the quality management system and

g. Recommendations for improvement.

5.9.6.3Review output

The output from the management review shall include any decisions and actions related to

a. Improvement of the effectiveness of the quality management system and its processes

b. Improvement of product related to customer requirements, and

c. Resource needs.

5.10 RESOURCE MANAGEMENT

This part complies with the requirements under clause 6of ISO9001:2000.

5.10.1Provision of resources

The organization shall determine and provide the resources needed

a. To implement and maintain the quality management system and continually improve its effectiveness, and

b. To enhance customer satisfaction by meeting customer requirements.

5.10.2Human resources

5.10.2.1 General

Personnel performing work affecting product quality shall be competent on the basis of appropriate education, training, skills and experience.

5.10.2.2Competence, awareness and training

The organization shall

a. Determine the necessary competence for personnel performing work affe product quality.

b. Provide training or take other actions to satisfy these needs.

c. Evaluate the effectiveness of the actions taken.

d. Ensure that its personnel are aware of the relevance and importance of their activities and how they contribute to the achievement of the quality objectives.

e. Maintain appropriate records of education, training, skills and experience.

5.10.3 Infrastructure

The organization shall determine, provide and maintain the infrastructure needed to achieve conformity to product requirements, Infrastructure includes,as applicable

a. Buildings, workspace and associated utilities.

b. Process equipment (both hardware and software) and

c. Supporting services (such as transport or communication)

5.10.4 Work environment

The organization shall determine and manage the work environment needed to achieve conformity to product requirements.

5.11 PRODUCT REALIZATION

5.11.1 Planning of product realization

The organization shall plan and develop the processes needed the for product realization. Planning of product realization shall be consistent with the requireme--nts of the other processes of the quality management system.

In planning product realization, the organization shall determine the following as appropriate:

a. Quality objectives and requirements for the product;

b. The need to establish processes, documents, and provide resources speci the product;

c. Required verification, validation, monitoring, inspection and test act--ivities specific to the product and the criteria for product acceptance.

d. Records needed to provide evidence that the realization processes and resulting product meet requirements.

The output of this planning shall be in a form suitable for the organization's method of operation.

5.11.2Customer- related processes

5.11.2.1Determination of requirements related to the product

The organization shall determine

a. Requirements specified by the customer, including the requirement: delivery and post- delivery activities.

b. Requirements not stated by the customer but necessary for specifie intended use, where known.

c. Statutory and regulatory requirements related to the product, and

d. Any additional requirements determined by the organization.

5.11.2.2Review of requirements related to the product

The organization shall review the requirements related to the product. This review shall be conducted prior to the organization's commitment to supply a product to the customer (e.g. submission of tenders, acceptance of contracts or orders. . Acceptance of changes to contracts or orders) and shall ensure that

a. Product requirements are defined,

b. Contract or order requirements differing from those previously expressed are resolved, and

c. The organization has the ability to meet the defined requirements.

Records of the results of the review and actions arising from the review shall be Maintained.

Where the customer provides no documented statement of requirement, the customer requirements shall be confirmed by the organization before acceptance.

Where product requirements are change, the organization shall ensure that relevant documents are amended and that relevant personnel are made aware of the changed requirements.

5.11.2.3Customer communication

The organization shall determine and implement effective arrangement communicating with customers in relation to

a. Product information

b. Enquiries, contract or order handling, including amendments, and

c .customer feedback, including customer complaints.

5.11.3 Design and development

5.11.3.1 Design and development planning

The organization shall plan and control the design and development of product.

During the design and development planning, the organization shall determine

a. The design and development stages

b. The review, verification and validation that are appropriate to each design and development stage, and

c. The responsibilities and authorities for design and development.

The organization shall manage the interfaces between different groups involv design and development to ensure effective communication and clear assignme responsibility.

5.11.3.2Design and development inputs

Inputs relating to product requirements shall be determined and records maintained. These inputs shall include

a. Functional and performance requirements.
b. Applicable statutory and regulatory requirements
c. Where applicable, information derived from previous similar designs, and
d. Other requirements essential; for design and development.

These inputs shall be reviewed for adequacy. Requirements shall be com unambiguous and not in conflict with each other.

5.11.3.3Design and development outputs

The outputs of design and development shall be provided in a form that enables verification against the design and development input and shall be approved prior to release.

Design and development outputs shall

a. Meet the input requirements for design and development
b. Provide appropriate information for purchasing, production and for service provision.
c. Contain or reference product acceptance criteria, and
d. Specify the characteristics of the product that are essential for its safe proper use.

5.11.3.4Design and development review

At suitable stages, systematic reviews of design and development shall be perform ed in accordance with planned arrangements

a. To evaluate the ability of the results of design and development to requirements, and

b. To identify any problems and propose necessary actions.

Participants in such reviews shall include representatives of functions concerned with the design and development stages being reviewed. Records of the results of the reviews and any necessary actions shall be maintained

5.11.3.5Design and development verification

Verification shall be performed in accordance with planned arrangements to ensure that the design and development outputs have met the design and development input requirements. Records of the results of the verification and any necessary actions shall be maintained.

5.11.3.6 Design and development validation

Design and development validation shall be performed in accordance with planned arrangements to ensure that resulting product is capable of meeting the requirements for the specified application or intended use, where known. Wherever practicable, validation shall be completed prior to the delivery or implementation of the product Records of the results of validation and any necessary actions shall be maintained.

5.11.3.7Control of design and development changes

Design and development changes shall be identified and record maintained.

The changes shall be reviewed, verified and validated, as appropriate and approved before implementation. The review of Design and development changes shall include evaluation of the effect of the changes on constituent parts and product already delivered.

Records of the review of the changes and any necessary actions shall be maintained.

5.11.4Purchasing

5.11.4.1Purchasing process

The organization shall ensure that purchased product conforms to specified purchas requirements. The type and extent of control applied to the supplier and the purcha--sed product shall be dependent upon the effect of the purchased product on subse--quent product realization or the final product.

The organization shall evaluate and select suppliers based on their ability to supply product in accordance with the organization's requirements. Criteria for selection, evaluation and re-evaluation shall be established. Records of the results of evaluati--ons and any necessary actions arising from the evaluation shall be maintained.

5.11.4.2 Purchasing information

Purchasing information shall describe the product to be purchased, including where appropriate

a. Requirements for approval of product, procedures, processes and equipment
b. Requirement for qualification of personnel, and
c. Quality management system requirements.

The organization shall ensure the adequacy of specified purchase requirements prio to their communication to the supplier.

5.11.4.3Verification of Purchased product

The organization shall establish and implement the inspection or other activities necessary for ensuring that purchased product meets specified purchase requirement Where the organization or its customer intends to perform verification at the supplier's premises, the organization shall state the intended verification arrangements and method of product release in the purchasing information

5.11.5 **Production & service provision**

5.11.5.1Control of production and service provision

The organization shall plan and carry out production and service provision under controlled conditions. Controlled condition shall include, as applicable

a. The availability of information that describes the characteristics of the Product.
b. The availability of work instructions, as necessary.
c. The use of suitable equipment.
d. The availability and use of monitoring and measuring devices.
e. The implementation of monitoring and measurement, and
f. The implementation of release, delivery and post-delivery activities.

5.11.5.2Validation of processes for production and service provision

The organization shall validate any processes for production and service provision where the resulting output cannot be verified by subsequent monitoring or measure--ment. This includes any processes where deficiencies become apparent only after the product is in use or the service has been delivered.

Validation shall demonstrate the ability of these processes to achieve planned result

The organization shall establish arrangements for these processes including, as applicable.

a. Defined criteria for review and approval of the processes,
b. Approval of equipment and qualification of personnel
c. Use of specific methods and procedures,
d. Requirements for records
e. Revalidation.

5.11.5.3Identification and trace ability

Where appropriate, the organization shall identify the product by suitable means throughout product realization. The organization shall identify the product status with respect to monitoring and measurement requirements. Where treaceability is a requirement, the organization shall control and record the unique identification of the product

5.11.5.4Customer property

The organization shall exercise care with customer property while it is under the organization's control or being used by the organization. The organization shall identify, verify, protect and safeguard customer property provided for use or incorporation into the product. If any customer property is lost, damaged or other -wise found to be unsuitable for use, this shall be reported to the customer and records maintained.

5.11.5.5Preservation of product

The organization shall preserve the conformity of product during internal process-ing and delivery to the intended destination. This preservation shall include identification, handling, packaging, storage and protection. Preservation shall also apply to the constituent parts of a product.

5.11.6Control of monitoring and measuring devices

The organization shall determine the monitoring and measurement to be undertaken and the monitoring and measuring devices needed to provide evidence of confor--mity of product to determine requirements.

The organization shall establish processes to ensure that monitoring and measure--ment can be carried out and are carried out in a manner that is consistent with the monitoring and measurement requirements.

Where necessary to ensure valid results, measuring equipment shall

a. Be calibrated or verified at specified intervals, or prior to use, ag measurement standards traceable to international or national measure standard; where no such standard exist, the basis used for calibratic verification shall be recorded.
b. Be adjusted or readjusted as necessary.
c. Be identified to enable the calibration status to be determine,
d. Be safeguarded from adjustments that would invalidate the measurement resi
e. Be protected from damage and deterioration during handling, maintenanc storage.

In addition, the organization shall assess and record the validity of the pre measuring results when the equipment is found not to conform to requirements. organization shall take appropriate action on the equipment and any product affe Records of the results of calibration and verification shall be maintained.

When used in the monitoring and measurement of special requirements, the abili computer software to satisfy the intended application shall be confirmed. This sha undertaken prior to initial use and reconfirmed as necessary.

5.12 MEASUREMENT, ANALYSIS AND IMPROVEMENT

5.12.1General

The organization shall plan and implement the monitoring, measurement, analysis and improvement processes needed

a. To demonstrate conformity of the product.
b. To ensure conformity of the quality management system, and
c. To continually improve the effectiveness of the quality management system.

This shall include determination of applicable methods, including statistical techniques, and the extent of their use.

5.12.2 Monitoring and measurement

5.12.2.1Customer satisfaction

As one of the measurement of the performance of the quality management system, the organization shall monitor information relating to customer perception as to whether the organization has met customer requirements. The methods for obtaining and using this information shall be determined.

5.12.2.2 Internal audit

The organization shall conduct internal audits at planned intervals to determine the quality management system

a. Conforms to the planned arrangements, to the requirements of this international standard and to the quality management system requirements established by the organization, and
b. Is effectively implemented and maintained.

An audit programme shall be planned, taking into consideration the status and importance of the processes and areas to be audited, as well as the results of previous audit. The audit criteria, scope, frequency and methods shall be defined. Selection of auditors and conduct of audits shall ensure objectively and impartially of the audit process. Auditors shall not audit their own work.

The responsibilities and requirements for planning and conducting audit, and for reporting results and maintaining records shall be defined in a documented procedure. The management responsible for the area being audited shall ensure that actions are taken without undue delay to eliminate detected nonconformities and their causes. Follow-up activities shall include the verification of the actions taken and the reporting of verification results.

5.12.2.3 Monitoring and measurement of processes

The organization shall apply suitable methods for monitoring and, where applic measurement of the quality management system processes. These methods demonstrate the ability of the processes to achieve planned results. When pla results are not achieved, correction and corrective action shall be taken, as approp to ensure conformity of the product.

5.12.2.4Monitoring and measurement of product

The organization shall monitor and measure the characteristics of the product to v that product requirements have been met. This shall be carried out at appropriate s of the product realization process in accordance with the planned arrangements.

Evidence of conformity with the acceptance criteria shall be maintained. Records indicate the persons authorizing release of product.

Product release and service delivery shall not produce until the planned arranger have been satisfactorily completed, unless otherwise approved by a relevant auth and, where applicable, by the customer.

5.12.3Control of non confirming product

The organization shall ensure that product which does not conform to pr requirements is identified and controlled to prevent its unintended use or delivery controls and related responsibilities and authorities for dealing with nonconfor product shall be defined in a documented procedure.

The organization shall deal with nonconforming product by one or more o following ways:

a. By taking action to eliminate the detected nonconformity;
b. By authorizing its use, release or acceptance under concession by a rel authority and, where applicable, by the customer;
c. By taking action to preclude its original intended use or application.

5.12.4 Analysis of data

The organization shall determine, collect and analyze appropriate data to demon the suitability and effectiveness of the quality management system and to eva where continual improvement of the effectiveness of the quality management sy can be made. This shall include data generated as a result of monitoring measurement and from other relevant sources..

The analysis of data shall provide information relating to

a. Customer satisfaction
b. Conformity to product requirements
c. Characteristics and trends of processes and products including opportunitie preventive action, and
d. Suppliers.

5.12.5 Purchasing

5.12.5.1 Continual improvement

The organization shall continually improve the effectiveness of the quality manage--ment system through the use of the quality policy, quality objectives, audit results, analysis of data, corrective and preventive actions and management review.

5.12.5.2Corrective action

The organization shall take action to eliminate the causes of nonconformities in orc prevent recurrence. Corrective action shall be appropriate to the effects o nonconformities encountered.

A documented procedure shall be established to define requirements for

a. Reviewing nonconformities (including customer complaints)
b. Determining the causes of nonconformities
c. Evaluating the need for action to ensure that nonconformities do not recur.

d. Determining and implementing action needed,

e. Records of the results of action taken, and

f. Reviewing corrective action taken.

5.12.5.3Preventive action

The organization shall determine action to eliminate the causes of pot nonconformities in order to prevent their occurrence. Preventive action sha appropriate to the effects of the potential problems.

A documented procedure shall be established to define requirements for

a. Determining potential nonconformities and their causes,

b. Evaluating the need for action to prevent occurrence of nonconformities,

c. Determining and implementing action needed,

d. Records of results of action taken, and

e. Reviewing preventive action taken. [**ISO 9001,Geneva.**]

CHAPTER SIX

INVENTORY ANALYSIS

6.1 INTRODUCTION

Inventories are those materials and supplies carried on hand by a business or institution either for sale or to provide inputs or supplies to the production process. All businesses and institutions require inventories. They are often a substantial part of total assets. Financially, inventories are very important to manufacturing companies. On the balance sheet they usually represent from 20 to 60% of total assets. From the Balance sheet of 30th June2001 of Khulna Shipyard Limited, total inventory (including Goods – in- Transit) found about 25% of the Current assets.

When inventories are reduced, their value is converted into cash, which improves cash flow and return on investment. Also there is a cost to carrying inventories, which increases operating costs and decreases profits of the company. Therefore good inventory management is very essential.

Inventory must not be managed at the aggregate level but also at the item level. To do so, management must establish decision rules about inventory items so the staff responsible for inventory control can do its job effectively. These rules involve the following:

- Deciding on the importance of individual inventory items and how they are to be controlled.
- How much to order at one time.
- When to place an order. [Tony, 1991]

6.2 INVENTORY COSTS

The order quantity and reorder point is to be determined by minimizing the total inventory cost. The total cost of general inventory model is summarized as a function of its principal components in the following manner:

Total inventory cost=(Purchasing cost)+ (Ordering cost)+(Holding cost)+(Shortage cost) [Taha,1996]

Purchasing cost

The value of an item is its unit purchase price. It becomes an important factor when the commodity unit price becomes dependent on the size of the order. That situation is normally expressed in terms of a quantity discount or price break.

Ordering cost

These are the cost associated with the fixed cost of maintaining an order (purchase) department and the variable cost of preparing and executing purchase requisition of an order either with the factory or a supplier. The elements Ordering cost are summarized below:

a. Preparation of purchase requisition
b. Preparation of purchase order
c. Mail
d. Expedition (telephone& telegraph)
e. Transportation
f. Receiving
g. Inspection
h. Put away
i. Updating inventory records
j. Paying invoice
k. LC
l. Customs [Hossain, 2002]

Holding cost

These are the costs /expenses incurred by the company because of the purchasing materials in advance and maintaining those materials in inventory. Costs originated from many sources are consolidated under the heading of holding cost. In general,

holding costs remain fixed to a certain inventory capacity and then vary with the additional quantity stored. The main elements of holding cost are:

a. Housing cost such as building rent, if leased, operating cost (Heating / cooling, lighting), depreciation and property taxes, ----(3-10%)

b. Material handling cost including equipment (lease or depreciation) expense, damages, wages, operating cost ----(1-3.5%)

c. Labor cost from extra handling ----(3-5%)

d. Investment costs such as borrowing costs, taxes and insurance on inventory ----(6-24%)

e., Pilferage, scrap and obsolescence ----(2-5%)

Shortage cost

It is a penalty incurred when any company run out of stock of a needed commodity. It generally includes costs due to loss of customer's goodwill as well as potential loss in income. Figure 6.1 illustrates the variation of the four costs

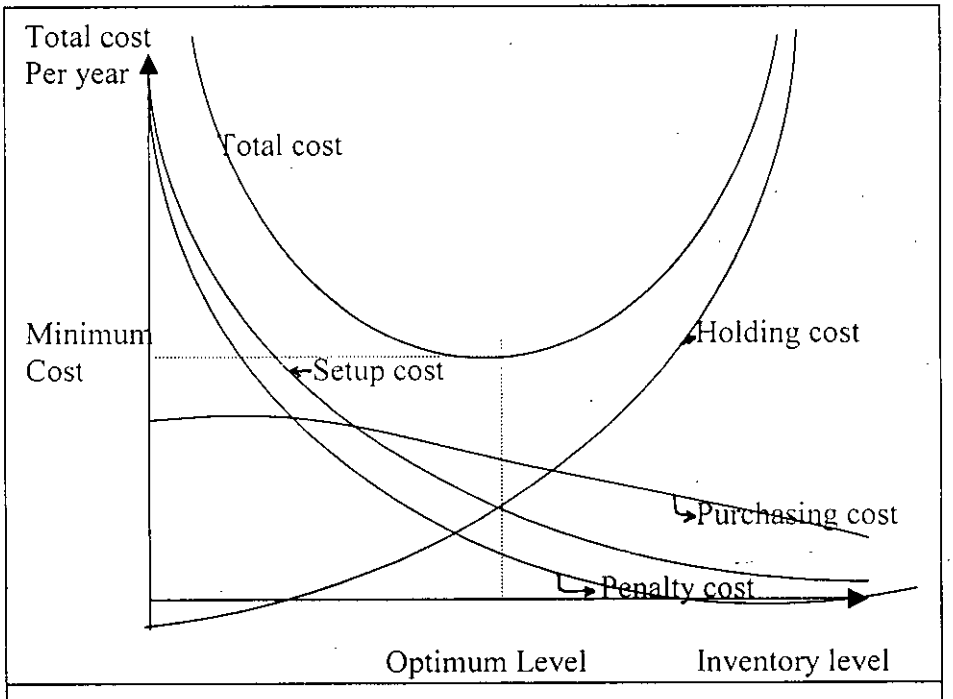


Figure: 6.1 Different Inventory Costs

components of the general inventory model as a function of the inventory level. The optimum inventory level corresponds to the minimum total cost of all four components. However in inventory model need not include all four types of costs either because some of the cost are negligible or will render the total cost function too complex for mathematical analysis. [Douglas,1990& Jain,2001]

6.3 SELECTION OF PRINCIPAL ITEMS FOR EVALUATION

There are thousands of raw materials, spares and items purchased and utilized every year in KSY. All the items are neither very expensive (price ranging from relatively inexpensive to possibly expensive units) nor frequently used. The items purchased in a year are not consumed in the same year; again few items are purchased several times in a year. During visiting central store it was found that for one particular construction work (Government) few Main engines, Generators, spare parts of those engines, and many other items were purchased many years back. But unfortunately that particular work order was cancelled due to unknown reason. As a result the total procured items for that particular job were not utilized for long time. Which increases the holding cost of items as well as depreciating the values. Practically it is also difficult for KSY to utilize the said items at once in other usual job. Because new construction works in KSY is limited. again the specifications do not match most of the times. However main engines has been utilized in some other constructions. But still many items are waiting for opportunity to come.

It is very difficult to list all the materials, spares, and items held in the central store. So, a sample of 50 (Fifty) items, which are usually used in different frequencies, is listed below. Here the lists of item are taken from KSY inventory list, but the quantity and price rates are assumed in line of the average annual consumption and average purchase rates in KSY. KSY uses different sizes of MS Plates like 3mm, 5mm, 6mm, 8mm, 10mm, 12mm, 15mm, 18mm, 22mm, 25mm etc. But the length and breadth are same for all plates as 8ft x 4ft.Again the price is also same, as it is bought in tons. So Annual usage of all sizes MS Plate is considered as a single item.

[List of 50 inventory items with assumed quantity and cost used in a given time period of one year.]

Sl. NO.	Name of Items	Quantity	Annual Taka Usage	%of total Taka Usage
1	MS Plate (all sizes)	305 tons	6633750/00	38.362%
2	MS Electrode (total)	121250 m	1817000/00	10.508%
3	Diesel (Dredging and Generator)	79560 ltrs	1611090/00	9.317%
4	Oxygen gas	33825cu m	1182000/00	6.835%
5	Wood Gorgon	1170 cu ft	678600/00	3.924%
6	Plastic wood (All sizes)	550 Sq m	610600/00	3.531%
7	Wood Mehagani	725 cu ft	580000/00	3.354%
8	Wood Shale	645cu ft	516000/00	2.984%
9	LP Gas	910 Bottles	394000/00	2.278%
10	Acetylene Gas	1800 cu m.	381000/00	2.203%
11	Wood Sundari	580 cu ft	325000/00	1.879%
12	Wood Shegune	210 cu ft	304500/00	1.761%
13	PVC Tiles	2350 pcs	258500/00	1.495%
14	MS Angles (all sizes)	6.5 tons	180375/00	1.043%
15	GI pipe (all sizes)	12000 m	180000/00	1.041%
16	Disc Grinding Stone (all sizes)	4500 pcs	146000/00	0.844%
17	Taper roller bearing	502 pcs	145000/00	0.839%
18	Sylhet Sand	196 cu m	143500/00	0.830%
19	Leather hand gloves	1120 pcs	139000/00	0.804%
20	Welding Cable	660 m	135000/00	0.781%
21	Aluminum Plate (8ftx4ft)	29pcs	130500/00	0.755%
22	Pig iron		115000/00	0.665%
23	Ply wood	275sq m	95500/00	0.552%
24	Glass wool		82500/00	0.477%
25	Synthetic fiber cloths		76400/00	0.442%
26	Electric Cable	2500 m	62500/00	0.361%
27	Aluminum chequared plate	10pcs	50000/00	0.289%
28	Acetylene/ Oxygen /LP gas hose	805 m	47050/00	0.272%
29	Hard coal		37500/00	0.217%
30	MS solid pipe various dia.		28330/00	0.164%
31	CopperPipes(hollow)various sizes	124 ft	26800/00	0.155%
32	Bathroom fittings		25600/00	0.148%
33	Rubber insertion sheet	310 kg	23600/00	0.136%
34	Copper	160kg	20000/00	0.116%
35	Stainless steel solid pipe		19750/00	0.114%
36	Glue		19250/00	0.111%
37	Zinc	110kg	12100/00	0.070%

38	MS wire nail	360 kg	10800/00	0.062%
39	GI union socket	210pcs	8000/00	0.046%
40	Lime stone		7800/00	0.045%
41	Welding torch		6800/00	0.039%
42	Tin	10kg	6000/00	0.035%
43	Fire Brick		5500/00	0.032%
44	Graphite		4500/00	0.026%
45	Manganese	16kg	2500/00	0.014%
46	Nickel		2450/00	0.014%
47	Files(Flat, Round, Triangular)	60pcs.	2400/00	0.014%
48	Antimony		1000/00	0.006%
49	Molasses	18kg	860/00	0.005%
50	Lead	10 kg	500/00	0.003%
		TOTAL TK.	17,292,405/0	100.000 %

6.4 ABC ANALYSIS

The division of inventory into three classes according to total Taka usage is known as ABC analysis. It is a system used to decide the importance of items, and therefore the type of control needed. The usage rating for each item is the product of its annual usage and its unit purchase cost. The typical pattern of Taka usage for 50-item sample of KSY is depicted in Figure.6.2 The A class, on which attention is concentrated, includes high-value items whose Taka volume typically accounts for 83.3 % of the material expenditures while representing only 20 % of the quantity volume.

A Item

Order quantities and order points are to be carefully determined. Procurement costs and usage rates are to be reviewed each time an order is placed. Tight controls are to be applied to stock records and to lead-time developments.

B Items

EOQ and reorder level calculations are to be conducted and the variables are to be reviewed quarterly or semiannually. Normal controls and good records are expected to detect any major changes in usage.

C Items

No formal calculations are required. The reorder quantity may be a 1-or 2-years consumption. Simple notation record when replenishment stocks are received, but no

attempt is require to made to keep a running account of the stock level. A periodic review, perhaps once a year, physically checks to be conducted the amount in storage. [Tony, 1991]

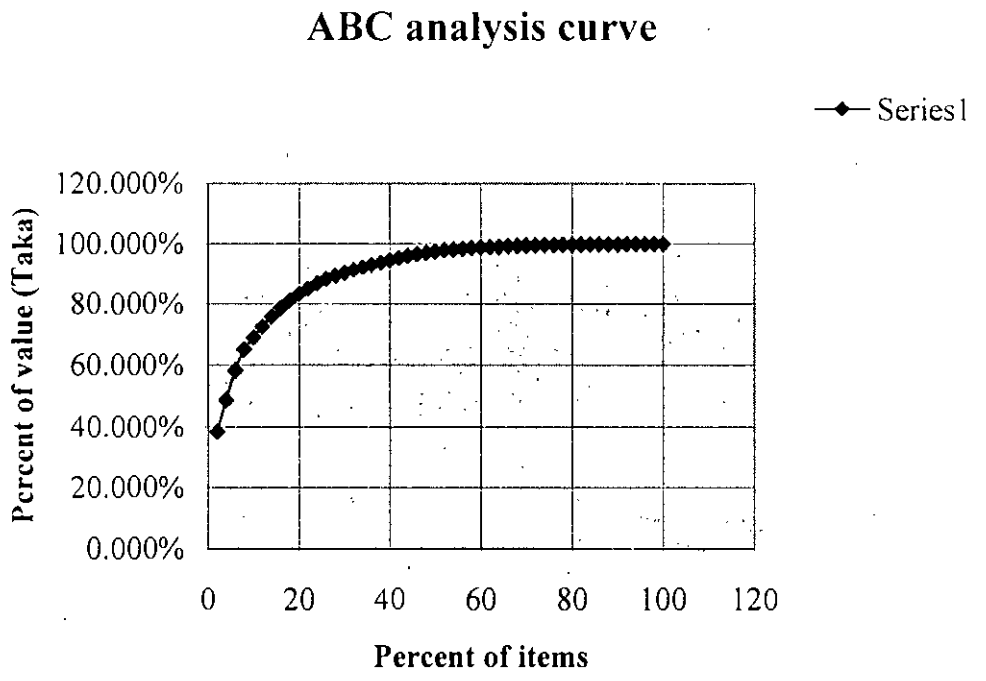


Fig: 6.2 ABC Analysis curve

The ABC analysis is usually the first step that must be applied in an inventory control situation. Once the important inventory items are identified, the total inventory management system becomes easier.

6.5 ECONOMIC ORDER QUANTITY, (EOQ) CALCULATION

The size of an order that minimizes the total inventory cost is known as the economic order quantity, EOQ. Following assumptions are made to determine EOQ.

- Demand is known and constant
- Items are purchased or manufactured in lots, not continuously
- Replacement occurs all at once
- Uniform consumption rate

The economic order quantity can be calculated using following formula

$$EOQ = Q = \sqrt{\{2AS/ic\}}$$

Where, A = Annual usage rate in units or Annual Demand

S = Ordering cost in Taka per order.

i = Annual carrying cost rate as a decimal of a percentage.

c = Cost (purchasing price) per unit in Taka.

Q = Economic Order quantity in units.

a. Calculation of economic order quantity of MS Plate

KSY uses about 300 tons of MS Plate per year (it is variable as the number of work orders varies), which is purchased at an average cost of Tk.24000/00 per ton.

Estimation of holding cost for MS Plate

Category	**Cost as a percent of inventory value**
i). Housing cost such as building rent, if leased, operating cost depreciation and property taxes,	----4%
ii)Material handling cost including equipment expense, damages, wages, operating cost	----3%
iii). Labor cost from extra handling	---3%
iv). Investment costs such as borrowing costs, taxes and insurance on inventory	----6%
v). Pilferage, scrap and obsolescence	--- 1%
Total holding cost =	17%

Estimation of ordering cost for MS plate

According to BSEC Purchase Manual, " if the goods are of non- proprietary types and their estimated value is above taka one lac, sealed quotations shall be invited at least two widely circulated daily news papers, one Bengali & one English." Earlier MS Plates were purchased from Chittagong Steel Mills, now there is no other source in the country. So, since closing of Chittagong Steel Mills all plates are imported from foreign countries. Only to advertise of 03 column 05inches in two daily newspapers costs about TK.=3 x 5 x

800 x 2 = 24,000/00. [Considering TK.800/00 per inches] For practical calculation following points to be considered.

Category	Estimated Cost
▪ Preparation of purchase requisition	
▪ Preparation of purchase order	
▪ Mail	
▪ Expedition (telephone& telegraph)	
▪ Transportation	
▪ Receiving	
▪ Inspection	
▪ Putaway	
▪ Updating inventory records	
▪ Paying invoice	
▪ LC	
▪ Customs	

For calculating the EOQ for MS plate ordering cost is considered = Tk.25000/00

So,

Economic Order quantity in units, EOQ= Q = $\sqrt{\{2AS/ic\}}$

Where, A = Annual usage rate in units or Annual Demand = 300 tons

S = Ordering cost in Taka per order.= 25000/00

i = Annual carrying cost rate as a decimal of a percentage.=0.17

c = Cost (purchasing price) per unit in Taka.= 24000/00

Economic Order quantity of MS Plate in units.

$Q = \sqrt{\{2x\ 300\ x\ 25000\ /0.17\ x\ 24000\}}$

= 60.63 tons

≈ 60 tons.

6.6 ECONOMIC ORDER INTERVAL (EOI)-CALCULATION SINGLE ITEMS

Economic order intervals (EOI) for single items can be calculated by using the following formula.[Richard,1988].

$T_0 = \sqrt{2C/RFP}$

Where, T_0 = Order interval in years

C = Ordering cost

R= Annual requirement

F= annual holding cost fraction.

P= Purchase cost of item.

Considering the above data for MS plate ,

Where, C= Tk.25000/00

P= Tk.24000/00

R= 300 tons

F= 0.17

$T_0 = \sqrt{2x25000/\ 300x0.17x24000}$

=0.202 Years [Considering 365 days a year]

= 73 days.

ECONOMIC ORDER INTERVAL for MS plate is 73 days in the context stated above.

6.7 ECONOMIC ORDER INTERVAL (EOI)-CALCULATION MULTIPLE ITEMS

In retailing and wholesaling, a separate order is rarely placed for each item. Frequently, a supplier provides numerous items, and it is more economical to place joint order. When all items from the same source are ordered jointly, the stock level review for these items can be coordinated and inventory maintenance can be kept to a minimum. Furthermore, the monitoring of stock levels often is less frequent and can be scheduled to fit comfortably with other organizational activities. Logistics and transportation cost savings also may be possible because of smaller materials handling costs and weight breaks in the transportation rate structure.

In preparing joint order, the quantity of each item to order depends on the time interval between orders for the entire group. The basic problem in this situation is the determination of the time interval **T** that will minimize inventory costs for the group as a whole. Once the optimum time (order) interval is established, the desired maximum

inventory level E_i for each item can be set in relation to it. From there, the individual order quantities can be calculated as the difference between each item's maximum inventory level and its stock position at the time of the order review.

The economic order interval can be obtained by minimizing the total annual cost. Neglecting stock out cost, the formulation is

Total annual cost = (purchase cost)+(order cost)+(holding cost)

Thus the Economic Order Interval (EOI) for multiple items is obtained as..[**Richard,1988**]

$$T_0 = \sqrt{2(C+nc) / F \Sigma^n_{i=1} R_i P_i}$$

= economic order interval in years.

Where,

R_i = annual requirement for item i

P_i = purchase cost of item i,

C = order cost for the joint order,

n = total number of joint order items,

c =order cost associated with each individual item,

F = annual holding cost as a fraction.

T_0 = order interval in years.

Following items are selected for calculating their Economic Order Interval (EOI).

Items	Annual demand, R_i	Unit cost P_i	Total Purchase cost $R_i P_i$
Electrode	121000 m	Tk. 15/00	1815000/00
Oxygen Gas	30000 cu m	Tk.33/00	1050000/00
LP Gas	1000 bottles	Tk.430/00	430000/00
Acetylene	1800 cum	Tk.210/00	378000/00
	$\Sigma^n_{i=1} R_i P_i$	Total: Tk. 3673000/00	

Assuming the order cost for the joint order C = Tk.2000/00 and for individual order c = Tk.1000/00 and annual holding cost as before, ie. F= 0.17

Economic order interval in years.=

$T_0 = \sqrt{2(2000+4x1000) / 0.17 \times 3673000}$

= 0.138 Years [considering, 365 days a year]

= 50 days.

Maximum Inventory level is calculated by using the following formula.

$Ei = Ri\ T_0 / N + Ri\ L / N$

Where, Ei = Maximum Inventory level

Ri = annual requirement for item i

T_0 = Economic order interval in years

N = Operating days in the year

L = Lead time

$= Ri\ (T_0 + L) / N$

[Considering Lead time ,L = 10 days and 365 operating days in a year.]

$Ei = Ri\ (50+10)/365$

$= Ri / 6$

So, the Maximum inventory level is obtained as shown in the following table

Sl.no.	Description	Max. Inventory level
a.	Electrode	20167 m.
b.	Oxygen Gas	5000 cu m
c.	LP Gas	166 bottles
d.	Acetylene	300 cu m.

CHAPTER 7

FINDINGS RECOMMENDATIONS AND CONCLUSIONS

7.1 INTRODUCTION

Bangladesh is a riverain country and its water transport plays an important role in its economy. On the other hand with about 700 km coastline Bangladesh has sovereign right to explore and exploit resources up to 200 NM towards the sea from the base line. More than 80% import and export are carried through sea route, as still it is the cheapest way of communication. So, shipbuilding industry in Bangladesh has still great importance and sufficient attention is to be given to improve it to certain standard.

The study was undertaken to make an overview of the present status of KSY and Business Process Re-engineering (BPR) in KSY. As Business Process Re-engineering deals with change. But most people dislike having to change. They like to think that what they are doing is right, and that if they need to change it because they have been wrong - and nobody likes to think they've been wrong. The problem remains, however, that in this fast moving world, old actions frequently fail to meet new needs. In fact it seems that only time people really like change is either when other people change, or when outside circumstances change to the individual's benefit.

It is worth mentioning that KSY is about 49 years old industry. Even though it is a well laid out yard, whose capabilities are remarkably high. The capacity has gone down because its machinery and equipment are old, as well as good number of permanent customers like Khulna newsprint mill, few jute mills, sugar mills, hardboard mill etc. became sick and closed. So, yearly number of work orders has been reduced. However, they are reliable and still can be used if properly maintained. But, in the past due to ill management, nosedive financial condition and lack of discipline, the workforce turned into an inefficient, irresponsible and self-controlled

group. Moreover, they were locked into an outdated working system, which made them unsuitable to operate under the present market environment. [Zaman 2000] That is why KSY was handed over to BN to run it commercially. New management of BN has definitely brought discipline among the workforce; added few outmost required tools, equipment and made the KSY as a profitable organization. Still the great limitation is that the management of BN does not have the experience of running a commercial organization. So, it may take longer time to change the overall outlook of KSY.

However, whatever the longer-term goals may be, re-engineering should be seen as part of the process through which it is ensured a strong alignment between strategic direction, business objectives, capabilities, processes, physical infrastructure and culture. Progress can then be measured through a balance scorecard of performance measures, which reflect critical aspects of business progress- external and internal, financial and non-financial.

7.2 FINDINGS OF THE STUDY

Bangladesh is an underdeveloped country and its socio-economic condition is poor. Huge number of private owned water transport like passenger carrying launches, inland oil tankers, mild steel body fishing trawlers, different type of barges and cargo vessels ply in the country. Moreover there are Tugs, pilot boats, dredgers, buoy handling vessels of port authorities, passenger carrying steamers of BIWTC, Ferries of Roads & Highways, pontoons of BIWTA etc. Most of the potential customers specially the private owners looks for shortcut in their manufacturing /repair works. So, many of the basic requirements are either omitted or shifted. For example, hundreds of large, medium and small private launches ply in different waterways in the country. They are constructed in most of the private owned dockyards at the cheapest possible cost, where the basic design and construction rules and regulations of water transport are hardly bothered, let alone safety and other regulations. A typical private dockyard consists of the following:

- 2/3/4 in no. sliping rail just on the river side,
- Few welding and gas cutting machine,
- Few unskilled welder & gas cutter,
- Electricity supply with local made transformer and open cables,
- One office room of 8ft. x10ft. size with one manager and one peon.

Cost of production in this type of yards is very less. When the ship owner supplies the MS Plate then, for one ton of steel the cost of production is not more than Taka ten thousand (10000/00). Another categories of private dockyard are there which have a good infrastructure and facilities than the stated one like Highspeed shipbuilding, Ananda Dockyard.

As a result it is seen that every year number of accident occurs in the river route causes huge lives. On investigation, in most cases the prime fault found is in design. Although the occurrence is repeating every year, but still no remarkable improvement has been found. Although KSY is the biggest shipbuilding industry of Bangladesh, but still there is no record of constructing a single launch by KSY.

However,the findings of the study are outlined below:

a. Quick decision-making is a very important necessity for a commercial organization. But KSY is severely suffering in this particular point. All major and in some cases even some minor decisions also require approval from the Naval Headquarters (NHQ). Thereby KSY is sometimes getting late in decision-making and loosing time and money.

b. The MD had financial capacity up to only TK. 10000/00(Ten thousand), which has been increased by NHQ up to Tk. 50,000/00(Taka Fifty thousand) only. Yet in this expensive market the present financial capacity of MD seems to be inadequate.

c. The yearly workload of KSY is getting stagnant, and remarkable new customers are not found.

d. The most important asset of any organization is its customer. An organization's success depends on how many customers it has, how much service they buy, and how often they buy. Satisfied customers will increase, buy more, and buy more frequently. So, understanding the customer's needs and expectations is essential to winning new business and keeping existing business.

e. KSY is run by the electricity supplied by PDB (Power Development Board). The maximum load consumption of KSY during peak working hour is about 1750 KW and the average load consumption is about 500 Kw. KSY had only one self generator (Generator No: 1) of 256 KW. The generator became very old and its output power deteriorated considerably. In case of emergency it could not meet the minimum requirement. So, BN provided one additional Generator (Caterpillar, 413 KW) on temporary basis in April 2001 to meet the emergency. Still, welding works cannot be carried out by the supply of those Generators during power failure of PDB. As a result, frequent disruption of power supply remains as one of the main reasons of hampering the production.

f. Riverside quay walls were broken severely and great threat for KSY was there due to erosion of river. Renovation of quay walls has been carried out by BN to protect KSY from erosion of river. Still the yard goes under tidal water in every monsoon hampering production. Moreover during rainy season due to rain the production specially welding, cutting of ships hull and other outside works are hampered.

g. KSY is situated on the bank of the river Qazi Bacha, and the river is severely affected by the deposition of silt. Two dredgers of KSY are in constant operation alternatively, especially in front of the slipway, which increases the cost of production as well.

h. Khulna shipyard is running by the directives of Naval Headquarters. BN officers are holding the top management post of KSY. BN Officers are very good leaders but they are grown up in defense environment which is not basically a commercial organization. So, when they are posted on deputation in KSY, it takes time to understand the technique, policy and calculation of costing in every step and way of controlling quality with optimum cost. Again there is a question of adjustment with civilian personnel. So as a whole when one officer is coming to be in balance he is transferred due to various service requirement or his personal requirement and another new officer is again posted. Sometimes frequent transfer of officers also takes place.

i. Before handing over KSY to BN through golden handshake a good number of senior skilled engineers, foremen and supervisors of KSY has retired. Afterwards the top-level management has been replaced by BN. But the mid level management like BSc. Engineers, diploma engineers, foremen, and supervisors were not replaced. So, acute shortage of midlevel management personnel observed in different workshops.

j. It becomes very difficult to undertake any emergency (Works to be delivered within very short time) works, as the purchasing of raw materials is a very time consuming process. Moreover spot tenders have got monitory limitation.

k. KSY is trying to participate in all possible tenders to get maximum work orders. But it is difficult to be the lowest bidder as KSY has huge amount of overhead cost (about 250%). This overhead cost is determined through a committee every year. So the work orders per year cannot be optimized, and sometimes-idle man-hour is produced. Which is one of the problems of increasing profit. In this connection it is to be added that sometime KSY authority try to bid tenders even out of their capability to receive works and complete it by subcontract to maximize profit.

l. To achieve an optimum production rate, the machinery and other accessories are to be technically appropriate for the purpose and are to be sufficiently reliable. In view of that Machinery limitations are becoming prominent day by day, as they are getting old, moreover with changing world the technology is also changing. For example Lathe bed, chucks wear out. So centering of jobs/works is carried out in improvised way, which is time consuming and reduces productivity. On the other hand few private competitors are enjoying the fruit of the modern machinery.

m. Sometimes tenders are floated to purchase raw materials, equipments, tools etc. either from local or foreign market. But it is found that only one or two suppliers are participating in the tender and quoting very high price from which it becomes difficult to make any choice, as a result fresh tender or re-tender requires to float. In this way purchase is delayed and production is hampered.

n. Every workshop there is few machineries; equipments and tools, which is not actually required at present scenario but is in working condition. Again few machineries; equipments and tools which is beyond economic repair and also not necessary for the workshop. On the other hand few new machineries; equipments and tools felt very essential which has been mentioned in chapter three.

o. Electric cable: electricity transmission lines are aged more than 47 years. It has been learned that, several problem already took place in the cables, which indicates the requirement of replacement of the total transmission lines within the shipyard. That may not be feasible at a time, due to involvement of huge budget. Again if any severe defects arise that results major repair / replacement of the cables then without any preparation that repair works may cause huge

loss of production, increase in large amount of idle man hours and liquidity demurrage to the customers.

p. During handing over of KSY to BN there was allocation of funds for payments of all dues and liabilities. But no allocation of money was there as working capital. So it was very difficult for the management to carryout production works who were there at the initial stage of taken over by BN. Still sometimes necessary inventory cannot be raised due to required capital, as the payment of bills by some customers are delayed due to administrative pilferage.

q. ARC Welding Reactor, known as Pot welding Transformer, which requires repairing, and maintenance more than once in a year. Every time it costs more than Tk 4300/00 for each machine. There are total 30 machines, which cost a total of Taka 129000/00 each time. More over its performance is not even up to standard after repair works. So it is felt that the repair works of those machines are no more economical. Those welding machines can be gradually replaced with new one.

r. Documentation and recording system in cost, account and finance department is good, but in some other cases are not up to the standard.

s. Procurement decision is still typically based on price in Bangladesh (especially in Govt. and semi-Govt. organizations), and KSY is also not out of that practice, as there is a risk of objection in audit, thereby awarding contracts to the lowest bidder. As a consequence, quality and timely delivery were sacrificed. Deming's fourth point, addressed this problem. He stated that customers must stop awarding business based on the low bidder because price has no basis without quality. In addition, he advocated single supplier for each item to help develop a long-term relationship of loyalty and trust. Again Dr.Kaoru Ishikawa has suggested that, "Both the customer and the supplier

should enter into a nonadversarial contract with respect to quality, quantity, price, delivery method, and terms of payments.[Besterfield, 2001]

t. KSY was a state owned company, and most of the rules &regulations were set many years back. But the world has been changed a lot, private competitors has been increased. So market share is decreasing due to few regulatory inconsistencies and constraints.

u. In Bangladesh Steel & Engineering Corporation (BSEC) Purchase Manual for press tender enquiry the provision is "if the goods are of non- proprietary types and their estimated value is above taka one lac, sealed quotations shall be invited at least two widely circulated daily news papers, one Bengali & one English." Now the cost of inviting tenders in newspaper has been increased much. If the flat rate of taka one thousand for one column one inch is considered, then for 3 column 5 inches tender notice in two widely circulated daily costs about Taka. 30,000/00 (Thirty thousand). Just for purchasing material/equipment of one lac ten thousand if only the tender inviting cost is thirty thousand, means about one fourth of the purchase price. Again there is also possibility of single offer (less than three quotations), which might lead to re-invitation will make the cost double. Again for press tender enquiry (PM, 1989, procedures sl no3.1.9,a) importable items (Plant, machinery, equipment) ,time for submission of offer is minimum sixty days. Then scrutiny by purchase committee, approval of NHQ and placing purchase order/contract and finally arrival of material/equipment requires more than six months. Some customers might not allow more than six months (or less than that) time to repair his ship. In that case it becomes difficult for KSY to manage those customers. So the customer is automatically dissatisfied and will not come for service second time. Likewise there are few more limitations in comparison to present commercial context in the BSEC Purchase Manual.

v. KSY currently procures raw materials on the basis of thumb rule instead of following any formal method of calculation of lot size, which may not be economical all the time as discussed about the different inventory costs.

w. Employee involvement, empowering them, and bringing them into the decision-making process provides the opportunity for continuous process improvement. The Manufacturers' Alliance for Productivity and Innovation stated that: "Organizations that empower employees as part of their total management effort are twice as likely as other firms to report significant product or service improvement."[Besterfield, 2001].

x. Employees need to become knowledgeable about the requirements of the customer and nominate quality problems for solution. In addition, they should know what they are supposed to do and how they are doing and have a commitment to improve their job.

y. KSY was running in very little profit or loss for last many years, so there was no opportunity of providing incentive bonus scheme to the employees. But according to the Ministry of industry reference number-Shilpa/aa-3/15/87/130 dated 30-7- 87 there is provision for incentive bonus scheme. KSY was handed over to BN with huge amount of accumulated loss and still it exists but most part has been recovered. At present KSY can fulfill up to certain major percentage of its production target and yearly profit is also significant.

z. Designing a ship may not be a complex task but definitely it is a difficult exercise, where constant interaction with intellectual information is essential. It is not always viable to maintain an establishment in terms of manpower and equipment to have a design section in every shipyard. Well-reputed firms exclusively dedicated for ship design are available around the world. It is more convenient and competitive to share their knowledge than to have own design

section. Many renowned shipyards around the world are practicing similar system and performing well. A well-equipped ship may have items starting from simple furniture and end with very high tech equipment. Thus shipbuilding yard is never a composite factory and has to shop around to get machinery, high tech equipment and various other materials.[Zaman, 2000].

aa. CBA was disbanded and a labor welfare committee with representatives from all trades of workers was formed in 2000 to ensure the right and welfare of the workers on temporary basis. According to the Government circular, the final decision is to be made regarding CBA activities by discussion among the Ministry of defense, Ministry of law and Ministry of labor and employment, which is yet to be finalized.

bb. The cost of MS plate in the world market has gone up to almost double during last about one year. Again the import tax and other duties are also sufficiently high. Elements of a typical structure for tax, Vat, and other related charges for purchasing machinery, equipment and raw materials from foreign countries are stated below (where the percentages are based on the C& F value):

- Custom Duty. ----------25%
- Supplementary custom duty ----------10%
- Insurance ----------3%
- Landing cost ----------1%
- VAT ----------15%
- Letter of credit (LC) authorization fee ------2.5%
- Advanced income tax ----------2.5%
- Development surcharge ----------3%
- Pre-shipment inspection ---0.5 to 1% orTk.36000/00.
- LC opening Bank charge ----------1%
- Clearing &Forwarding charge, port dues, labor charge, carrying and transportation etc.---------2.5%

Moreover the income tax on finished product (selling price) is to be paid separately. These may be considered a great barrier in flourishing shipbuilding industries.

The impact of globalization of trade, free market economy and liberalization of trade has been significant on the industrial sectors in general. On the other hand the state policy for developing industrial sectors (especially heavy industries) in the country, political situation, activities of terrorist group in the country, administrative pilferage system, Bank loan policy for especially shipbuilding sector, and requirement of most of the customers and their intention of availing lowest possible price irrespective of quality concept gives an idea that, it would not be unrealistic to say that the overall scenarios in ship building industries in terms of applying modern management techniques is not to be very encouraging, if any foreign customers can not be attracted by developing infrastructure and management.

7.3 RECOMMENDATIONS

Following are recommended:

a. One commodore may be appointed as MD of KSY and thus he might be empowered fully in respect of financial and administrative capacity. That will reduce correspondence pressure, save decision making time, increase efficiency and productivity.

b. Steps may be taken to ascertain the machineries; equipments and tools of every workshop actually required and are in good working condition. The rest machineries; equipments and tools which is beyond economic repair and also not necessary for the workshop may be disposed off as per regulation. Again few machineries; equipments, tools are found to be very essential for the workshops as stated in chapter 3, may be provided in the shops.

c. Customer satisfaction, not increasing profits, should be the primary goal of the organization.It might be the most important consideration, because satisfied customers will lead to increased profits.

d. Case study and feedback is very essential in case of previous loosing tenders as, KSY bid in different types of tenders to obtain work order.

e. Strict compliance of production schedule seems to be very important to keep customer satisfied and in case of failure, post assessment of the reasons and efforts is necessary to avoid those in future.

f. As the success of KSY mainly depends on management and that is hold by BN. So the loss of KSY due to frequent transfer of top management officers may be evaluated. In this regard BN can think in a bit different way, what is actually practiced in foreign defense oriented dockyards /shipyards, ie. Carrier planning of few officers for dockyard & shipyard only.

g. Continuous efforts are to be made to earn reputation and confidence of the valued customers. Survey among the potential customers may be carried out to find the actual reason of not offering work order in KSY and corrective actions (if feasible) may be carried out.

h. Productivity Monitoring Cell may be introduced to monitor and analyze the monthly or quarterly production and suggest the top management regarding achievements, failures, bottlenecks and continual improvements.

i. Efforts to be continued to utilize all dead items in the central store held for long time, if not possible should be disposed off as soon as possible to realize the unused capital and also make room for new inventory.

j. Customer (KSY) and its supplier have limited resources, they must work together as partners to maximize their return on investment. That can only be achieved having very good relationship, which is based upon trust, dedication to common goals and objectives, and an understanding of each other's expectations and values. That will definitely improve quality, increase efficiency, lower cost, increase opportunity for innovation, and continuous improvement of products and services.

k. Constant liaison and commercial relations may be introduced with foreign reputed shipyard for design and search customers in the international market in joint venture.

l. For commercial necessity logistical linkage or good liaison with at least one reasonable cost offering steel mill, engine manufacturer, generator manufacturer, and other prime equipment manufacturer or dealer is essential.

m. ISO9000:2000 may be introduced in KSY to improve the Quality Management System.

n. Regulatory inconsistencies and constraints of KSY in present commercial context may be modified /reviewed.

o. BSEC Purchase Manual may be reviewed by appropriate authority where necessary, in the context of current commercial requirements.

p. Reward scheme for excellent works may be introduced, which will also motivate the workers.

q. Uniform flow of material is required with minimum possible inventory in hand.

r. Block modular construction concept (where applicable) may be introduced to take advantage of down hand welding as well as environmental protection available at present by ensuring the maximum unit weight within the capacity of the mobile crane.

s. Computerization and group technology codification may be introduced in central store. Local area network between stores, accounts, purchase department and all concerned shops may be installed to make rapid communication, readymade information, produce database and finally increase productivity and efficiency.

t. Procurement of raw material can be carried out by suitable lot-size determining method, to reduce the total inventory cost significantly.

u. Efforts may be taken to reduce material handling time by introducing appropriate material handling gears and facilities.

v. Necessary steps are essential to replace the total electric cables in KSY as deemed viable by the concerned authority at the earliest.

w. At present context gas generators are much more economical but as there is no gas supply at KSY so, feasibility of installing diesel generator at the range of over 2 MW may be carried out to overcome the hampering of production during power failure/disruption.

x. Training should be viewed as an investment, not an expense. So institutional training for employees may be arranged as necessary to provide quality and productivity awareness, problem solving, cost effectiveness, safety and overall technical aspects of the job.

y. Recruitment of mid level personnel as per requirements as mentioned earlier may be considered.

z. As sometimes some workshops do not have enough workload, so diversification of workers in other jobs and thus maximum utilization of workforce & reduction of idle man-hour in particular shop may be continued by giving necessary training to few personnel in more than one trade. On the other hand, in future if any recruitment of worker is carried out then such requirement may be emphasized.

aa. It is felt that the repair works of those ARC Welding Reactor machines are no more economical. Those welding machines can be gradually replaced with new one.

bb. Incentive Bonus Scheme may be introduced at least to a minimum possible level until total recovery of accumulated loss. That will definitely motivate the employees and will enhance total productivity.

cc. In order to attain continuous improvement in quality and productivity, Total Quality Management (TQM) principals, tools and philosophies should be applied as necessary.

7.4 CONCLUSION

The main objectives of this project work were:

a. Study the current state of Khulna shipyard, along with its business processes.
b. Identify critical processes for re-engineering.
c. Evaluate the inventory status and policy of KSY.
d. Suggest for re-engineering the processes

The total work was developed in different stages and each stage is conclusive in itself. It is felt that, sooner the re-engineering can be done in Khulna Shipyard is better for the organization.

7.5 SCOPE OF FUTURE WORK

Due to time constraint just a macro level study has been carried out, details of every individual production process could not be covered. Eventually huge scope of future work remains, few are appended therein.

- Detail study of every individual manufacturing process to find the drawbacks in context to modern manufacturing process.
- Feasibility of applying modern manufacturing techniques and equipment.
- Determination of percentage of waste and scrap of raw materials and rework of finished product wherever it occurs.
- Percentage of nonconformities in all phases of everyone's work.
- Activities that do not add value to the product or service.
- Evaluation of in process and overall performance using Benchmarking and other relevant measuring tools.

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