TOTAL QUALITY MANAGEMENT
A SYSTEM TO IMPLEMENT

Implementing Continuous Improvement

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FOREWORD

I am very impressed by the information Mr. Kiritharan has gathered and the determination he makes about its application. He is reaching out to help the reader have a clear understanding.

Most of those in management, as well as many quality professionals, view quality as a sort of add-on to activity. Actually it has to become embedded in the daily activities of each area. We manage to deal with financial management and schedule management as an integral portion of every thought. Continuous emphasis is placed on these two at meeting after meeting. Executives can get fired for not taking proper care of them.

Quality, however, is often handed over to the quality department for caretaking. They work at getting certifications for quality programs or winning awards or helping to meet schedule and financial problems. Most companies with quality problems deliver the majority of their product or service on the last week of the month.

Looking at quality as doing what was agreed rather than 'goodness' is a big step in reversing this application custom. Quality has to be built into the fabric of the organization. I think this book is a big step in bringing this about.

- Philip Crosby
Winter Park, Florida

PREFACE

Increasing market competition, increasing price of raw materials and improvement in information management system by the usage of computers have all led to a search for a better philosophy in the world of management. Total quality management is the final product of this search.

Almost 75 years have passed since TQM principles emerged as a separate discipline in America. During this time lots of books have been written and many consultants have come up but still we often hear of big companies having to call back products because of complaints about quality. What are the reasons for this ongoing problem? Quality management consultants agree that implementing quality management strategies requires a change in culture, a change that is often difficult to achieve. This change requires a strong commitment, more consultation, training and education. It is unfortunate that traditional management schools are not yet ready to accept that quality management is a separate discipline that requires a separate program. Marketing principles also need to be changed from advertising techniques to customer expectations.

When I was first introduced to this subject I went to a bookstore – bought a couple of books and tried to expand my knowledge. I faced two problems. First, all of them were written in a language that difficult to understand for a person who had learned English as a second language. Second, they were written in a technical language for executives and middle managers, which made it difficult for a professional from another discipline or a supervisory person to get much use from such books.

This book is an attempt to provide a solution to the above problems. Quality management principles are simplified as much as possible and written in simple English so that everybody can read and understand them. This book will be of use to professionals from non-management disciplines, supervisory people in all fields and students getting introduced to this philosophy.

Chapter One

INTRODUCTION

1.1 TOTAL QUALITY MANAGEMENT: PREVENTING DISASTERS

Human civilization has produced major achievements and inventions in many fields during the 20th century. It may be democracy as a form of governance, the control of infectious diseases in the medical field or the electronic transfer of money in banking and much more; but we are still unable to escape from man-made and preventable natural disasters. Until now, we did not know how to escape economic depression or prevent the bankruptcy of well-established companies. Take the service sector for example; over 20 years have passed since the goal of 'Health for all by 2000 AD' was proclaimed in Alma Ata. We have reached the year 2000 and what have we achieved? One study shows that, of the world's 6.8 billion inhabitants,

- 1.5 billion people are living without safe drinking water.
- 2.5 billion people are living without basic sanitation.
- More than 1 million people are without access to primary health care.

The same study warns that the situation may get worse in the future. What went wrong and why does this reality exist despite all our knowledge and control over Nature. Although a lot of human, monetary and material resources are allocated to solve these problems, we are still failing here.

"After a brief introduction about quality problems faced by the world today, this chapter will explain the history of Total Quality Management and its concepts. This chapter also explains the possible difference between service and manufacturing sectors in understanding the TQM principles".

Chapter Two

DEFINITION

2.1 DEFINITION OF COMMON TERMS IN TQM

Before defining the terms used in quality management, it is best to try to understand what is meant by *quality*. Asking a class of motivated students for a definition of the terms would provide a number of answers: accountability, availability, price and so on. The choice of the best or most important definition from this group will vary for different people, different situations and different products. Total Quality Management tries to escape this problem by leaving the definition open; 'Customers define quality'. This places a great responsibility on the service provider, to look beyond education, experience and international standards and towards the customer in order to find out his or her expectations. The problem is not solved even if the customers' expectations are accurately known; changes in situation or simply the passage of time may lead to different expectations. Although the customers' expectations are subject to a great deal of variation, the service-provider is expected to spend time and money in trying to accurately ascertain them. The following four "As" are usually expected from the service-provider by a customer.

1. Accountability
2. Affordability (Price)
3. Availability
4. Appearance

"This chapter will define terms used in TQM. It includes the definition of Common terms, Measurement terms, Indices, Techniques and tools used in TQM, some Japanese terms and terms for the TQM system".

Chapter Three

COMMITMENT TO CONTINUOUS IMPROVEMENT

3.1 PROBLEMS WITH COMMITMENT

Within the industry today, the most frequently used word is probably 'computer'. The next frequently used word is probably 'quality'. Despite this, 25–50 percent of any standard quality management textbook will be devoted to problems regarding commitment to continuous improvement. More often than not, it is the upper management that gets the blame.

Although there is a widespread acceptance that quality is highly valued by customers and several textbooks have been written on how to achieve quality, there is still an unwillingness to change fundamental attitudes in order to achieve the goal. The following are some of the most common reasons for this failure.

3.1.1 Short-term Profit Motive

Even though customers respect a company on the basis of its quality, investors such as shareholders and banks only look at the profit margin or price of shares. Top management's immediate motive is to satisfy the shareholders. It is common practise to evaluate the credibility and efficiency of the top management by the price of shares, not by the quality of the products.

There are several ways to make a profit: cutting corners, closing down plants, encouraging 'voluntary' redundancies, cutting down on training, cutting down on the facilities available to employees, shipping everything in the stores without a care for quality and one step beyond this; shipping things that are not in the store, on paper, to show a greater profit. All of these methods can increase the price of shares and profit for a short

period of time but slowly and steadily these measures will bring down the quality, leaving unsatisfied employees and consumers. This finally leads to the collapse and bankruptcy of the company.

"*This chapter will explain in detail the reasons and ways to overcome the commitment problem faced by the management world today. It also explains the different costs associated with TQM implementation process and how it will affect the profit of the company; How to break the barriers which prevent TQM implementation, the importance of a change at this juncture and commitment problems in the service sector are the other subjects discussed here*".

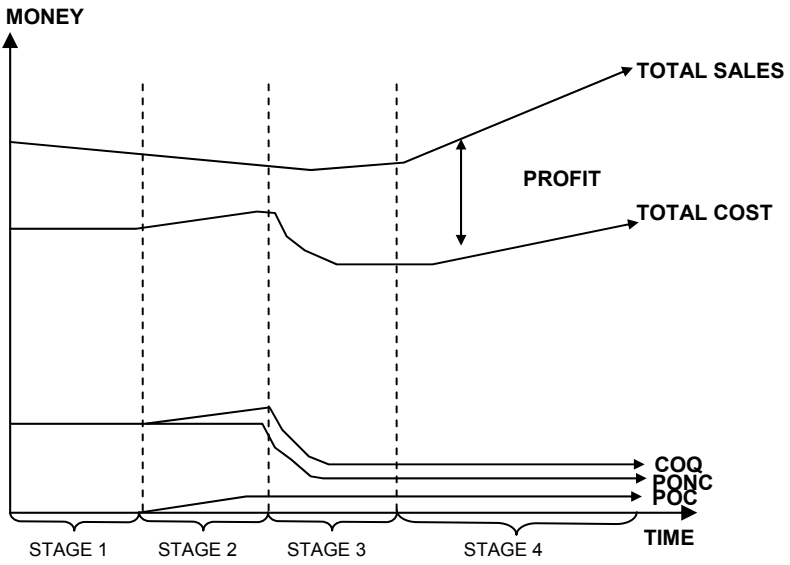

Fig 3.1 Different Costs Incurred During Different Stages of TQM Implementation.

3.4 WE NEED TO CHANGE TODAY

Everyone must accept and understand that a new form of industrial revolution is before us, in the form of a quality revolution. The opening of new markets, greater competition for each product and the revolution in information management made possible by computers have all made this revolution both necessary and possible. Companies have to take notice and make changes, as a failure to do so will mean being washed away in the revolution.

Of course, what Deming's said remains true, "A big ship traveling at full speed requires distance and time to turn around." However, this should not be taken as an excuse for laziness or unnecessary delays in implementing changes. A ship that thinks it is a big monopoly and can therefore face any revolution without danger will be the next "Titanic". Even if this thought does not lead to change, a few more words from Deming might prove helpful: "you do not have to do this; survival is not compulsory." The Titanic experience did not put an end to sea travel and many smaller ships traveled in the same sea without danger by respecting nature and its revolution.

Chapter Four

PRODUCTION: UNDERSTANDING EVENTS

4.1 INTRODUCTION TO PRODUCTION PROCESS

Most normal day-to-day work follows a standard pattern: a set of actions is performed upon a set of inputs to produce an output. Even when making a cup of coffee, this pattern is followed. We take coffee powder, water, milk and sugar and then boil the water, mix the coffee powder with the boiling water and then filter the mixture. After this, we mix milk and sugar to produce the final output-a cup of coffee. This process is called IPO (Input – Process – Output).

Making a cup of coffee is a simple process that involves only one person where the input supplier and the output consumer are easy to identify. However, with a more advanced production process, such as making a computer or educating a student, the process will be more complicated and should be broken into smaller sub-processes that make the final product. The sub-processes may be completed by different companies or by different departments within the same company. In the industrial world the sub-processes will converge, starting with many different products and ending in one final completed product.

"*After a brief introduction to the Production process, this chapter explains cycles of management functions (Eg:- Deming Cycle). In addition, this chapter also tries to compare organizations to human body to improve management practice. It also explains similarities and differences in the production process between service sector and industry*".

Chapter Five

UNDERSTANDING CUSTOMER EXPECTATIONS

5.1 CUSTOMER EXPECTATIONS

One of the most important quality management concepts is 'customer satisfaction'. In today's market a customer making a purchase decision is faced with a great deal of choice. This makes him/her focus on quality. What does quality mean for the customer? This varies from customer to customer. Some customers look for accountability, others for price. As we have seen in Chapter 2, these expectations can be grouped into the four As.

- Accountability
- Affordability (Price)
- Availability
- Appearance

When we buy a product we want it to perform certain functions. Only when we are satisfied with the functions of the product for an expected time period do we accept that product is accountable. After we are satisfied with accountability, sometimes even before that, we check whether the product is affordable. The third thing consumers look for is whether the product will be available for use as soon as it is bought. Finally, some consumers place more emphasis on the appearance of the product. Which out of the four is the most important varies from consumer to consumer and from situation to situation; therefore, it is the consumer who defines quality. Let us explore in detail the four elements of quality.

5.1.A Accountability

When a product or service is able to perform its expected functions without any problems, it is considered accountable.

How does a customer come to think that a product is accountable? Usually by advice from friends or people he or she considers reliable. Accountability is therefore not easy for a company to achieve. Only the customers themselves can give a certificate of accountability. Are there any other ways to achieve it?

> "*After a detailed explanation about the customer expectations regarding quality, this chapter explains the new way of defining the word "customer" - internal customer, intermediate customer etc. This chapter also studies challenges faced in communicating with the customer and identifying customer expectations and ways to over-come these challenges. In addition it also briefly explains problems encountered in satisfying customers in the service sector*".

Chapter Six

FINDING A MEASUREMENT SYSTEM

6.1 MEASUREMENT CHALLENGES

Having discussed ways to discover customer dissatisfaction, the next challenge is to translate that dissatisfaction in a technical language that will help to plan corrective action. This task is associated with finding measurements that will help understand customer dissatisfaction and productivity. It has two parts; the first is to list the conformance and non–conformance areas along the production line, the second is to change non-conformance to money values such as PONC so that upper administration and investors can understand the amount of money that is being lost through non–conformance.

There are a number of challenges to be faced when trying to achieve this task. In the history of medicine the first person who tried to measure the pulse and respiratory rate of humans was criticized for trying to damage the values of medicine. But scientists who came in later almost decided that anything could be measured. This attitude is expressed in Lord Kelvin's dictum: "Whatever exists, exists in some quantity and can therefore be measured."

> "*After discussing challenges faced in establishing measurement scales, this chapter explains money-oriented TQM indices and non-money oriented TQM indices. This chapter also elaborates on building a TQM skeleton in a company and measurement challenges faced in the service sector*".

Chapter Seven

RECORDING NON-CONFORMANCE AND IDENTIFYING ROOT CAUSES

7.1 RECORDING NON-CONFORMANCE

The previous chapter on 'Measurement' showed that it is the duty of quality assurance people and quality checkers to check products against a requirements list and ensure that they are all achieved. While quality people pass conforming goods to the next stage of production, they will also need to do an important job with non-conforming products. They must record information about non-conforming material in an organized manner so that it can be analyzed and the necessary corrective action can be taken. How and where should this information be recorded?

7.1.1 Checksheets

Instruments or tools called *checksheets* are used for this purpose. Checksheets are designed for the purpose of recording either conformance or non-conformance. Checksheets used to record stock or the functions of a machine can be thought of as conformance checksheets.

Checksheets recording non-conformance can be used for two purposes: one for recording non-conformance in a product and the second for recording non-conformance regarding a process or machine. A checksheet used to record the non-conformance of a product usually has four parts:

1. General information and information about the department
2. Information about the product and process
3. Records about non-conformance
4. List of non-conformance issues that need to be reported.

The first part, general information and information about the department indicates the department using the checksheet and the quality checking section responsible for recording non conformance as well as the name or ID of the quality checkers recording non conformance.

> "*After explaining tools and techniques used in recording non-conformance, this chapter explains* ***STATISTICAL PROCESS CONTROL*** *in detail. This chapter also explains the methods used to organize and analyze collected data and identifying root causes with the help of such data*".

Chapter Eight

DEVELOPING A COMMUNICATION SYSTEM FOR TQM

8.1 IMPORTANCE OF COMMUNICATION

Quality management is an information related-management system. An efficient communication system is an important requirement for the functioning of quality management systems.

Quality management requires the communication of different types of information: information about customer complaints that must be transferred to the appropriate department for necessary corrective action and feedback information about defective goods in each department. It is also important to communicate with employees about the progress of quality management and the corrective actions that are being taken. Basically, when a quality management system is being implemented, it is important to communicate with everybody so that all employees are kept informed about the changes going around.

A communication system is also important in developing a common language inside the company to break down the barriers of fear that block the path towards quality improvement.

8.2 A COMMON LANGUAGE FOR THE COMPANY

In quality management one of the important issues that is discussed from different perspectives is the use of slogans. There are two different ideas regarding the use of slogans. On one side, it is argued that slogans develop a common language that motivates employees while the other view rejects slogans as an unnecessary irritation for employees that causes fear and conflicts between employees. It is possible to solve this problem through the human body example that was discussed in Chapter Four.

"*After exploring the importance of communication and a common language for the company, this chapter also explains the importance of fear free communication to break the barriers for quality improvement. This chapter also lays a foundation for the company-wide communication system and suggestion system which is an important part of quality improvement. In addition, this chapter explains communication challenges in the service sector*".

Chapter Nine

TOWARDS A BETTER UNDERSTANDING OF EMPLOYEES

9.1 MOTIVATING THE EMPLOYEES

One of the most challenging questions facing every manager is how to motivate the employees. One of the most frequent answers to the question is that there are no constant factors that work beyond a certain period of time. Several philosophies have been elaborated and several studies have been conducted to answer above question. Let us focus on one particular study that will provide a deep understanding of the issues surrounding employee morale.

9.1.1 Hawthorne Experiments

These studies were conducted by the Harvard Business School at the Hawthorne plant in Illinois, USA. The research was conducted from 1924 to 1932 and the reports were published over a period of approximately 10 years thereafter. The studies were known as the Hawthorne Research or the Hawthorne Experiments. The researchers were trying to identify factors responsible for the motivation of employees. Many factors were investigated-for example, what effect lighting might have on employee productivity.

The researchers increased the level of lighting in an experimental room and found that productivity increased, but when the level of lighting was reduced, the productivity was again found to increase. An increase in productivity was also noted in a control room where lighting was not altered. In another experiment, despite various changes, it was found that productivity remained low and constant.

The experiments were undertaken at a time when the idea of individuality remained supreme in industry; the ideas of Adam

Smith had firmly taken root. The worker was viewed as an economic man selling his individual labor at the best possible price he could secure as a competitive individual. His objective was the profit motive and it was believed that most of his energies were directed towards this objective.

However, the Hawthorne experiments seemed to show the importance of social and human elements in the behavior of individual workers. The investigators noticed the development of a new 'social situation' during the course of the experiment. They noticed the formation of informal groups, or 'cliques'. These cliques worked according to the working conditions: when they thought that the conditions were favorable to them they worked hard to maintain them. In other instances, when a clique thought that working slowly would provide job security, no inducement could make them work faster. From these experiments, the following facts can be discerned: positive team spirit can only bring better productivity; work security is important in establishing good productivity; good productivity requires a good team leader.

> "*After discussing the ways to motivate employees, this chapter explains strains in the factory system of production and ways to overcome them. This chapter also briefly discusses human psychology, modern leadership and employees in the service sector*".

Chapter Ten

TRAINING AND EDUCATION FOR QUALITY IMPROVEMENT

10.1 IMPORTANCE OF TRAINING

All quality management professionals agree that training and education are important in the quality improvement process. As previously discussed, quality management is a new culture and a new way of thinking, so without education and training such changes of culture cannot be achieved. Managers and other professionals have to be educated in quality management objectives and tools so that they can develop good control over them. More importantly, all other employees inside the company have to be educated to understand the importance of quality, customer satisfaction and be helped to develop some understanding of quality management tools. This understanding is important as it will help dispel the fear that is produced when the quality management process is being implemented. Quality management is an information-based management system and only education and training can provide employees with the necessary information.

When discussing training, it is important to remember that this includes retraining. Although the brain has the power of memory, it also has the weakness of forgetting; so it is important that all employees receive periodic retraining. This is specially important in certain sectors, such as medicine and technology where there is a rapid expansion of knowledge. New technologies and new methods are constantly being produced; reeducation and retraining are the only ways to maintain market position. Training does not have to be restricted to training in knowledge and skills. People working in services such as the police or fire brigade should receive regular physical training and periodic physical checkups. In Japan mild exercise in the

early morning is considered beneficial for all employees. It is worth remembering that quality production has been most fully developed in Japan.

The cost of training is usually the most important factor that hinders the implementation of a training program. Training and retraining are large costs in the annual budget. The important fact that has to be remembered is that the cost of mistakes that arise out of inadequate training will usually be far greater than the cost of training itself. If employees do not have a sound and updated knowledge of their field, they will not be able to produce good quality products or services.

"*After discussing the importance of training, this chapter also discusses the psychology of training process and tools which can be used in training programs. In addition, this chapter subdivides and explains how to develop a quality oriented training program for company*".

Chapter Eleven

IMPLEMENTATION QUALITY IMPROVEMENT

11.1 CHALLENGES OF IMPLEMENTATION

It is often the case that a company or organization that would like to make change is ready and prepared to make change but finally nothing happens. This also happens with individuals, for example many students intend to prepare conscientiously for exams but finally escape before the exam with a medical excuse.

There are a number of reasons for this problem: poor commitment, poor planning, poor implementation and, in some instances, personality problems and so on. The key thing to understand is that nothing will happen unless someone does something. In quality management 'Doing something' is changing the culture and management style of the company.

Changing the culture is not an easy objective to achieve. Section 3.4 discussed the idea that time is needed for change. This is well illustrated by Deming's words "a big ship traveling in full speed requires distance and time to turn around". When talking about cultural change a feasible time-frame could be 'Generations'. One generation consists of 33 years; this does not mean that 33 years are needed to implement a quality management program in a company. Depending on the size and problems of the company, the time needed may vary from 3 to 15 years or more. But a total change of society towards quality - quality products, quality services and a quality environment in which to live - may take one or two generations after everyone has fully committed towards the goal.

Let us now discuss the components of change and the procedures for making a change.

11.2 MAKING A CHANGE

The changes that take place around us can be grouped into two major categories. The first is ‘natural’, that is changes that occur as a result of the natural and intrinsic quality of the things and organism. The second type is ‘intended’ changes that are conceived by human beings. Although natural changes are unavoidable and influence the quality of work a great deal, they are beyond the scope of this book. In the context of quality management, it is more useful to discuss intended change. When discussing change it is important to accept one central fact. Although there is a clearly identifiable need for change and many advantages will result from it, the behavior of human groups and culture is extremely resistant to change. Despite this resistance, changes take place as a result of necessity and as a way of survival.

> "*After a brief introduction about challenges of implementation, this chapter explains the psychological and sociological components of a changing process and breaking the barriers of changing process. This chapter also explains the division of responsibility in TQM implementation amongst different personnel in an organization and a step-wise procedure for solving problems in a company. Finally, this chapter gives a brief introduction regarding implementation in the service sector*".

Chapter Twelve

SCIENTIFIC METHODS OF PROBLEM SOLVING

12.1 INTRODUCTION TO SCIENTIFIC METHODS

If you read a book written by a quality management consultant you will certainly come across the importance of science and scientific-methods of problem solving in quality management practice. Science is certainly one of the important factors which help human civilization achieve success. Even though the main scientific inventions started to come around the 18th century, the roots of scientific thinking can be tracked as far back as Greek and Roman civilizations. What is science or what is the definition of science? Even though science helps us solve problems and define the knowledge, finding a single definition for science is not possible. There are simple definitions like "method of solving problems" and complicated definitions like "systematic approach to extension of existing knowledge and common sense".

Even though each definition is justifiable in different circumstances, it is better to consider science as a method of solving problems for the TQM discussion because it not only is simple but also gives direct relation to TQM, which tries to solve problems in the production and service sector. In a scientific method how are problems solved? Basically, problems are approached in five different steps to find a solution.

Step 1: Identifying Problems.

Here problems are identified and defined. When doing so, you have to divide the problem as small as possible and try to define each problem in simple definite terms easy to understand.

Step 2: Formulating Alternative Explanations.

After identifying problems, alternate explanations or solutions are formulated. Each of them will explain or give a solution to the problems in a different way, in a different angle or in a different philosophy.

Step 3: Conducting Experiments.

Here each alternative is tested for accuracy. What has been done here is small-scale experimental activity for each alternative under different control condition and the results are recorded.

Step 4: Analyzing Results.

The results of experiments are analyzed to find out the best explanation or solution for the problem.

Step 5: Finding the Solution.

According to analysis, the best explanation or solution is identified and implemented.

One important point we have to keep in mind is that we are selecting only the best alternative; it does not necessarily need to be the correct alternative. This concept is explained as “Science accepts lies as truth until truth gets identified”. In practical content it is important for us, as when we reached one solution for a problem it is not the end of the subject. Till the absolute answer gets identified, we have more room for experiments and analysis.

"*After this introduction the chapter explains the scientific methods and research methodology in Social Sciences and the possible classification of knowledge fields. This chapter also briefly analyzes how the present information revolution can change the market situation”.*

Chapter Thirteen

STATISTICS FOR MANAGERS

13.1 INTRODUCTION TO STATISTICS

Statistics is a method or field of study which helps us to classify, analyze and test the accuracy of data collected through different methods. What do we mean by data? Data consist of discrete observations of attributes or events that carry a definite value but little meaning. Information is obtained by summarizing; adjusting for variation and presenting data in a logical form that could give us some understanding about the incident or problem. Information will have a definite value in contrast to opinion, which won't have a definite value. Simply this difference can be explained with the following example – '6 feet 2 inches' is a data. 'Raja is 6 feet 2 inches tall' is information, and 'Raja is taller' is an opinion.

13.2 PRESENTATION OF DATA

Data, once collected, must be arranged in an order to understand the incidents clearly and meaningfully. In statistics, we have several methods of presenting the data: tables, charts, diagrams, graphs, pictures and special curves. Let us study these methods briefly.

13.2.1 Tabulation

In tables, data are organized in columns and rows. They are devices to present masses of data in simple format. A table can be simple or complex depending upon the number and type of

measurements. When designing tables for any reason, there are certain general principles to be considered.

(a) The tables should be numbered. For example: Table 1, Table 2, etc.
(b) The title must be brief and explanatory.
(c) The headings of columns or rows should be clear and concise.
(d) The data must be presented according to the size or importance in ascending or descending order whenever possible.
(e) If percentages or averages are to be compared, they should be placed as clearly as possible.
(f) No table should be too large.
(g) Vertical arrangement of data is better than horizontal arrangement because most people find it easier to read data from top to bottom than left to right.
(h) Footnotes may be given whenever necessary, providing explanatory notes or additional information. An example is Table 13.1.

"*After an introduction to statistics and tables, this chapter also explains other methods of presentation (Eg:- Bar Charts, Histogram, Frequency Polygon, Pie Chart and Picto Gram). In addition this chapter also explains other statistical concepts like statistical averages (Mean, Median and mode), sampling and normal distribution*".

Chapter Fourteen

UNDERSTANDING ABOUT COMPUTERS

14.1 INTRODUCTION TO COMPUTERS

The most frequent word used in business world today may be *computers*. Computers are being used almost in every function of management. They help in marketing, are used in accounting, for planning and organizing and so on. Even though installing and maintaining a computer system is a computer engineer's job, it is better for managers to have an understanding of their capacity and limitations so that we can use them in our work more efficiently.

14.3 DATA BASE MANAGEMENT SYSTEM

As we have seen earlier, it is the most important subject a quality management person likes to know in computer science. A Data Base Management System is essentially a collection of interrelated data and a set of programs to access this data. Usually DBMS offers the following services.

- Data Definition: It is a method of defining data types that need to be stored.
- Data Maintenance: It checks whether each record has fields containing all information.
- Data Manipulation: This allows data in the database to be inserted updated deleted and sorted.
- Data Display: This helps in viewing data.
- Data Integrity: This ensures accruing of the data.

When a DBMS meets certain standards of American National Standard Institution [ANSI] it is called Relational DBMS [RDBMS]. An RDBMS can support a common computer language called *structured quarry language* [SQL]. With the help

of SQL you can create a database, maintain data in it and revise necessary information whenever you need. Examples for RDBMS are Oracle, Sybase, SQL Server, and DB2 etc.

"*With this Introduction about computers and relational data-bases, this chapter explains the different kinds of software and functions of a computer. This chapter also gives a sample quality management data-base and a set of SQL quarry commands explains power usefulness of SQL language*".

In addition to the complete information above with facts and figures, this book also comes with following appendices.

Appendix A:
A set of random numbers for sampling program in your worksites.

Appendix B:
A Sample Quality data-base for you to practice SQL commands in chapter 14.4.

Appendix C:
A questionnaire to evaluate the completeness of TQM system in your company.