

CHAPTER 1

- **INTRODUCTION**
- **SCOPE AND OBJECTIVE OF THE WORK**

1.1 INTRODUCTION

Humanity has always been conscious of quality. In the early days of human history, quality was largely a privilege enjoyed by the upper strata of society. It related to items where no quantitative indicators could then be provided, such as food, clothing and the like; one was conscious of quality as an attribute, and also of its significance for aspects of safety [Rao, 1996].

The Industrial Revolution brought about a major change, with mass production of goods that had a high degree of uniformity; it also made goods available to much larger numbers in society; and increasingly, quality became measurable in terms of a variety of physical parameters which could define the extent of uniformity, how products would behave through their life such as failure rates, and the like. Particularly over the past half a century, quality consciousness has grown tremendously. Consumers are now increasingly aware of defects, which affect appearance, performance, interchangeability, life, etc. Even in the present age of industrial production, there are high cost products conforming to the highest standards of quality; and it was assumed that large volume production would be subject to some departures. Japan changed this image, with its emphasis on "Zero Defects". It was able to sell its products for mass consumption not only at lower prices but also defect-free. This involved not only attention to production and production

technologies, but also equally to design and all that underpins it. The concept of quality now permeates hardware as well as software.

As a result of these transformations there has been increasing demand on areas of science that are of importance in design and production. One of the principal areas of scientific endeavour relating to this is statistics. As India moves into a new regime of taking its place in the global scene, it is good to bring to the notice of scientists, producers of goods in various areas, entrepreneurs and policy makers, the variety of aspects that relate to ensuring of quality and the role that science has to play in this.

MAHALANOBIS – A MESSIAH OF QUALITY

Professor Prasanta Chandra Mahalanobis put our country on the world map of statistics [Rao, 1996], although he began as a physicist and taught that branch of science in Presidency College, Calcutta for more than two decades. The Professor also created the national Sample Survey Organization, the Central Organization of the Government of India, as well as the Department of statistics. He also made distinctive contributions to the problem of transforming an ancient civilization and society through planning.

As our country transits from agrarian civilization to industrial civilization, we will have to pay a heavy price if our education system fails to sensitize every child to a feeling for Quality. Professor Mahalanobis understood this and brought to use the knowledge, which is known as

Statistical Quality Control and Quality Assurance as well as Reliability together with knowledge of operations Research and Multivariate Analysis.

Sensitiveness to quality as to beauty and love is not quantifiable. But without a passion for these, there will be neither an improvement in the quality of our daily life, nor quality of our production system or in the service sector. Prof. Mahalanobis was, in our country, a Messiah of "Quality".

The vital question of, what is now referred to as, "sustainable development". We have to define its parameters. So, even as we discuss in depth the specific problem of ensuring quality through engineering, we must not forget the wider dimensions of human predicament, as we stand poised on the eve of the commencement of the third millennia of history. We Indians have to come to grips not merely with the hardware of quality, engineering, production and processes, but the software of values of our evolving society, caught up by a conflicts and tensions.

We are of course aware of the fact that the processes of industrialization as have taken place in history create a severe problem of alienation of human beings from the production process. As the saying goes, he or she becomes a mere cog in the wheel. But it is possible to overcome the alienation if management, production engineers and, of course, the entrepreneurs inform their knowledge and expertise not only by a feeling for quality, but making production culture cooperative and not

individualistic. It is our impression that this has been successfully achieved in Japan. There is another point and it is addressed to our countrymen who are engaged in the production processes. It would be an absurdity on their part to think that one can divide the production process into two halves, one of which produces something for "export quality" alone and the rest is dumped on the Indian market. It is also an economically wasteful practice. The imperatives of quality cannot be ensured by appointing Quality Inspectors any more than the efficiency of a boiler can be maintained out of fear of the factory inspector. The fact that our scientists and engineers working in the Indian Space Research Organization (ISRO) and elsewhere too have shown that it is possible to sensitize everyone to the imperatives of "quality assurance", one can resume that the task in India is not abinitio hopeless, however, as the saying goes, one swallow does not make the summer, he "will and passion for quality" has to permeate in our educational system, in our value system, in our public life and projected through every institution involved in the process of communication, whether the communication is oral, written or electronic.

1.1.1 Quality :

Definition -1

Quality means "**Conformance to the Specifications or requirements**":

[Crosby,1996] The requirements are all the commitments involved in giving the customer what was agreed. Some of them are administrative,

some are procedural, some involve product specifications. They are the answers to all the questions involved in running the company. People must learn their job and requirements that are involved and then learn how to do them exactly. When we learn to improve and do things better, then the requirements are officially changed. This definition is something that can be easily explained to everyone. In this process it eliminates arguments about "how good" anything is. If we talk about the requirements, then the question comes "What are the requirements ? Are we meeting them ? Are they correct ?" Emotion leaves the scene and people can do business together.

Definition -2

Quality means **"Zero defects, or Defect free"** : [Crosby,1996] This means doing things right the first time, every time, with no allowable error. When something goes wrong we find out the root cause in order to prevent it from ever happening again. Quality must be achieved by prevention rather than detection. Prevention means that we will think out the process, learn how to implement it, get every trained, and in essence do things right the first time. We do not accept error in any form. We do not want to disappoint our customers.

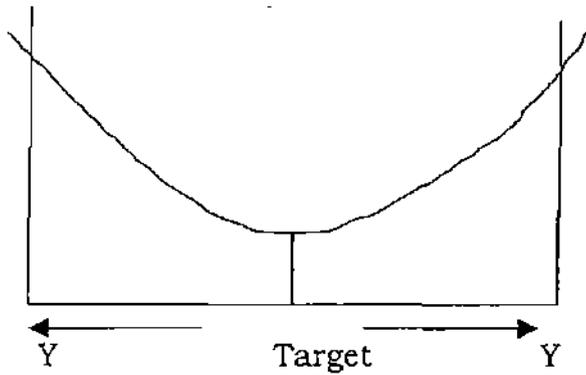
Definition -3

"Quality is the loss imparted to the society from the time the product is shipped". (Taguchi's definition of quality)

Where does the loss to society come from? There are two sources contributing the loss to the society. They are inconsistent product performance and harmful side effect [Anand,1996]. The automobiles emit too much smoke, air conditioners making too much noise are products of poor quality as they are polluting environment. This is so because pollution is the loss imparted to the third person, who is neither Product must be environment friendly and should not disturb or spoil the environment. The second source of loss to society comes from inconsistent product performance. Factors contributing to this are many and the important one are design, material and manufacturing process. Less variation during manufacturing always result in consistent high performance product. Our paradigm on quality as "conformance to specification or requirements" comes in the way of reducing manufacturing variation beyond the specification limits.

Our aim should be to reduce variability to zero. This will result in the production of consistent quality product. Variability increases as we move away from the target and loss to society also increases as we move from the target.

$$\text{Loss} = K Y^2$$



Taguchi Loss function

Definition -4

Quality means "**Customer Satisfaction**"

In a competitive environment, the customer is necessarily the focus of all activities of organizations producing and selling goods and services. Customer oriented quality control is one of the six basic principles of the Japanese Company Wide Quality Control (CWQC). Total Quality Management (TQM) calls for a change in the mind-set where company orientation is replaced by customer orientation [Anand,1996]. One of the core values and concepts promoted by the American Malcolm Baldrige Award is customer-driven quality and one of the award criteria categories is customer focus and satisfaction. Indeed customer satisfaction figures in some way or other in the declared quality policies of most organizations.

If customer satisfaction is not to remain an empty word, companies will have to build quality systems and activities around this objective. However, it is only the industrial buyers or large customers who are in a position to specify their quality requirements in precise details, measure quality after purchase and during use and thus rationally evaluate their sense of satisfaction. For the majority of customers, particularly those of consumer products or durable, satisfaction is a nebulous feeling. Inevitably answers will have to be found for some pertinent questions. What is customer satisfaction? What factors influence it and how? What are its consequences particularly with reference to customer retention? Should customer satisfaction be maximized or minimized? Researchers in Management Science have been increasingly pondering over these questions in recent years.

Definition -5 (As per ISO)

The totality of characteristics of an entity that bear on its ability to satisfy stated and implied needs.

1.1.2 THE ROLE OF THE SCIENTIST AND ENGINEER IN QUALITY IMPROVEMENT

Since the 1960s, the United State has found itself in an increasingly competitive world market. At present, we are in the midst of an international revolution in quality improvement. The teaching and ideas of W. Edwards Deming were instrumental in the rejuvenation of Japan's

industry. And in American industry, in order to survive, must mobilize with a continuing commitment to equality improvement. From design to production, processes need to be continually improved. The engineer and scientist, with their technical knowledge and armed with basic statistical skills in data collection and graphical display, can be main participants in attaining this goal [Richard,2000].

The quality improvement movement is based on the philosophy of "market it right the first time." Furthermore, one should not be content with any process or product but should continue to look for ways of improving it.

1.1.2.1 The Statistical Content of Quality-Improvement Programs

Although there is a tendency to think of the subject of quality as a recent development, there is nothing new about the basic idea of making a quality product characterized by a high degree of uniformity. For centuries skilled artisans have striven to make products distinctive through superior quality, and once a standard of quality was achieved, to eliminate insofar as possible all variability between products that were nominally alike. What is new in quality improvement is the idea that a product is never good enough and should be continually improved. This concept, honed to the fine edge in Japan, has created a crisis in the international market place for firms that do not follow suit. In quality-improvement programs, the emphasis is on employing designed experiments to improve the product in the design, production, and

assembly stages rather than in futile attempts to inspect quality into a product after it is produced. The main thrust of the statistical approach is that, in order to improve quality, it is better to work upstream on the processes. That is, build quality into the product by concentrating on the equipment, components, and materials that go into making it. The consumer has also a role in the new way of quality improvement. It has always been (1) design a product, (2) make it, and (3) market it. Now, there is a new fourth step, (4) find out the purchasers' reactions to the product. Also find out why others did not purchase. Statistical methods of sampling will provide a way of finding out what the consumer thinks. Changes can then be made in design and production to better match the product to the market. These four steps must be repeated over and over again in the search for continual product improvement [Richard,2000].

1.1.3 Performance Measurement and it's Purpose

Performance measurement is simply a process which involves the assessment of an organization's performance on a regular basis, and that alone has to be a good thing. But more importantly performance measurement has the capability to modernize culture by developing and unifying best business practice and thereby providing the energy needed to fashion the organizations development [Performance Measurement Manual, 1997]. A sound Performance measurement will keep the business focused on its vision, and keep everyone united behind business needs and objectives. A sound performance measurement

system is a strong creative driving force. Enlightened organizations realize that it is not simply the system but the energy that the system is capable of producing that will generate individual and corporate excellence. Enlightened organizations will remedy performance measurement shortcomings, train people in its use, extend the contribution performance measurement makes to corporate strategic life, make it relevant to people's daily needs, and end its isolation by linking it with other key management processes so that the culture will be transformed into one of progressive and continual organizational development. The employer should establish a scheduled performance measurement period. Ideally every six months. If the first performance measurement is scheduled say four months before the business plans are created then it represents an opportunity to cascade up change and development opportunities, needs, and resource requirements, etc. If the second performance measurement is scheduled immediately after the organization has established its annual business plans then the performance measurement represents an ideal opportunity to cascade organizational aims down and throughout the organization [Cardy, 1998]. It is therefore valid to have different performance measurement objectives depending on the above and the organizations current need with variation to recognize the needs of local situations. In this way performance measurement is both a proactive and a reactive, flexible and

adaptable and above all participative instrument. The performance measurement process provides opportunity to :

- ❖ Ensure that the organization effectively communicates its Business Plan objectives. The performance measurement will enable the appraisee to relate how their role and contribution supports the achievement of these objectives.
- ❖ Encourage/promote the desired managerial style and organizational culture management style is critical to business success and should organizations wish to move to a culture of empowerment, responsibility and trust the participative and development aspects of performance measurement will help them achieve it.
- ❖ Encourage team-working with performance measurement showing how the appraisees role links not just with the organizations objectives but with peer roles, team-working is fostered with the consequential positive effect on cost and quality.
- ❖ Encourage care for customers, colleagues, and the environment with performance measurement focusing attention not just on the appraisers contribution and competence but the impact of their behaviour (positive or negative) upon their environment and relationships, care for customers, colleagues and the environment will all be improved.

- ❖ Encourage individuals to take personal responsibility taking responsibilities for decisions and actions encourages everyone to work effectively and the performance measurement process allows such areas to be discussed and clarified.

- ❖ develop every individual to maximize their contribution to the business the performance measurement process commits the organization to the training and development of employees to maximize their job satisfaction and individual contribution. The performance measurement process therefore is a formal opportunity for the parties to agree on issues, needs and action plans.

The performance measurement system is therefore at the centre of organizational life and without effective performance measurement, change and development lacks purpose, direction and commitment. The performance measurement process has the biggest influence on culture and productivity. The performance measurement is not idealistic it is practical and essential. One of the most important aspects of performance measurement is that of personal development. The developmental approach to performance measurement recognizes employees as individuals with concerns and needs. The developmental approach uses performance measurement as a contributor to employee motivation, development, and human resources planning.

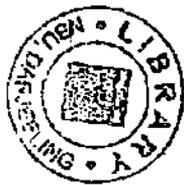
1.2 Scope and objective

The scope and objective of this work is to identify and interpret the content characteristics of organization performance evaluation in quality organizational environment. This is based on an examination of a range of source material such as books, papers, articles and the candidate's long experience in institutionalisation of quality system in various organizations. The study focuses on the important content issue with regard to the measurement of person factors and its relationship with system factors [Thiagarajan and Zairi, 1997] designed to support the performance measurement system. Managers can use the relationships and interdependencies between person and system factors to adapt their systems in important ways so that the practice maximally contributes to the quality effort. The study can be very useful to the organizations attempting to identify the characteristics that may provide a foundation for the quality-driven performance evaluation.

A very large volume of literature on performance measurement those suggest that performance measurement is an advanced management tool [Performance Measurement Manual, 1997] that is becoming more and more sophisticated in order to accommodate needs of different communities. It, therefore, necessitates to pay our attention to develop a performance measurement system that will enable it's users to spot weaknesses and threats, as well as strength and opportunities. Thus, better knowledge of strengths and weaknesses will give the users an

opportunity to diagnose organizational growth capabilities and take relevant actions. In this work, the proposed model is intended to provide a simple, easy-to-use approach to determine the relative degree of maturity of an organization's quality management system and to identify the main areas for improvement. The proposed model for assessment usually performed by the peer groups or by qualified assessors. The intent of assessment is also to provide fact-based guidance to the organization regarding where to invest resources for its improvement. The model is dedicated to extending the scope of organizational performance measurement beyond the conventional focus on internal, historic, financial, numeric and short-term data. It serves not only as a source of information but also as a guide for the evaluation of the effectiveness of a quality driven performance measurement system. The specific feature of the model is that it will keep the business focused on its vision, keep everyone united behind business needs and objectives. It will create a strong driving force in the organization and the organization will realize that it is not simply the system but the energy that is capable of generating the corporate excellence, transforming the culture into progressive and continual organizational development towards world class system. The present work has, therefore been undertaken with a view to classify a manufacturing industry into levels [Crosby, 1979; ISO-9004, 2000] based on their quality performance. For the purposes of our discussion we have implemented the model in different manufacturing

industries. The work may be extended to non-manufacturing industries also, if feasible.



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