INTRODUCTION

Introduction to TQM

As a sequel to ‘Euro-pessimism’ – decline in European Community share in the world trade from 1979-85, the so called ‘new approach’ was undertaken in 1985 by European nations in order to achieve the mutual removal of the internal barriers between the member states of European Community (EC). As a part of this, Cockfield Report was adopted proposing a seven year time table for abolition of barriers within EC as a cornerstone of single European Act (Moravcsik, 1991). The main thrust of these initiatives is that intra-EC’s physical, technical and fiscal trade barriers should be removed. For this it was decided to have unified European Market after 1992 consisting of member states of EC namely France, Spain, Italy, Portugal, FRG, UK, BELGIUM, Netherlands, Ireland, Denmark, Luxembourg and Greece. The unification has been seized by Brussels, the headquarters, as a means of finally achieving harmonization of legislation and in doing so, the consumer has been given a pivotal position when it comes to his safety and protection. This is expressed in the new guidelines concerning quality, environmental protection and product liability.

For uniformity in trade amongst member-states of EC and also imports to EC nations from developing countries, standardization and certification is must. For hazardous products, there would be harmonized EC regulations with a certified CE mark on a product to regulate:

- Safety
- Public Health
- Environment.

The International Standards Organization, ISO at Geneva formulated ISO 9000 series for adoption by non-EC nations. One European Committee for Quality System assessment and certification (EQS) was founded on October 12, 1989, and the objective of this committee was to promote the implementation and acceptance of the ‘third party certification’ of quality systems for companies. One European Organization for Assessment & Certification (EOTS) has been setup on November 28, 1990 to see that EC countries have assessment system trusted mutually.
The Need for Total Quality Management (TQM): The Pathway to Achieve Global Competitiveness

It is now being widely acknowledged (Fernandes, V., 1992) that adaptation of global quality standards like ISO-9000 adoption would be only pass-port and not visa for export to a particular country as a contract would also depend on terms and conditions of price, delivery and service with the client.

The strategic approach to facilitate ISO certification among other things is to develop Total Quality Management in the organization in every area of operations. The quality concept has been there in Indian industry but restricted to manufacturing operations that too only control part of it, thereby excluding planning and improvement of quality across all departments.

1. The Evolution Of TQM:

The philosophy of TQM has evolved in following sequence with change in market conditions and customer requirements time to time:

**Figure 1: Evolution of TQM**

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Quality
  Quality Control
    Statistical Quality Control
      Total Quality Control
        Quality Assurance
          Total Quality Management
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Quality has been defined as ‘fitness for use’ or ‘conformance to requirement’. The British Standards Institution (BSI) and the American Society for Quality Control (ASQC) define Quality as:

‘Quality (Freund, R.A, 1987) is the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs’.

A classification of various definitions of quality has been proposed by Garvin (1984):

**Transcendent definition**: Quality is neither mind nor matter but a third entity independent of the two, even though quality cannot be defined, you know what it is.

**Product based definition**: Difference in quality amount to differences in the quantity of some desired ingredient or attribute.

**User based definition**: Quality consists of the capacity to satisfy norms.

**Manufacturing based definition**: Quality means conformance to requirements.

**Value based definition**: Quality is the degree of excellence at an acceptable price and control of variability at an acceptable cost.

Other research works (Garvin, D.A., 1987, 1988) have suggested that customers are heavily influenced by eight dimensions’ in determining quality levels.

- Performance: It refers to the primary operating characteristics of a product.
- Features: The secondary characteristics that supplement the product’s basic functioning.
- Reliability: The probability of a product’s failing within a specified period of time.
- Conformance: The degree to which a product’s design and operating characteristics match pre-established standards.
- Durability: It is a measure of product life, having both economic and technical dimensions.
- Serviceability: It refers to speed, courtesy and competence of repair.
- Aesthetics: It refers to as to how a product looks, feels, sounds etc.
- Perceived quality: It refers to assessment of standards relying on indirect measures when comparing product brands.

**Customer-Related Definitions**

There is, however, growing support for quality to be closely associated with customer demands. Some of the definitions of quality related to customer are given below:
1. The quality concept rejects the traditional notion of quality as being the degree of conformance to a standard or measurement of workmanship. The Japanese concept of quality (Sohal, A.S, Tay, G.S., Wirth, A., 1989) hinges on the product’s fitness for use’ and the degree of customer satisfaction’ derived from using that product. In other words, it is not the products but the customer who determine whether or not quality has been achieved.

2. Quality is achieving and exceeding customer expectation in order to provide business for the future. The goal is to achieve a ‘continuous quality improvement effort’ (Dingus, V.R., 1988) that permeates every process, every product and every service in organization.

3. Quality is the capability of a product or service (Johnson, M.M.) to satisfy ‘knowingly’ those preconceived composite wants of the users that are intelligibly related to characteristics of performance or appearance and do not cause major overt or covert reactions or actions by other people.

A study (Tamimi, N., Sebastianeli, R., 1996) that asked managers of 86 firms in the eastern United States to define quality produced several dozen different responses, including the following.

1. Perfection
2. Consistency
3. Eliminating waste
4. Speed of delivery
5. Compliance with policies and procedures
6. Providing a good, usable product
7. Doing it right the first time
8. Delighting or pleasing customers
9. Total customer service and satisfaction

The foundation of total quality is philosophical (Evans, J.R., & Lindsey, W.M., 2006): the scientific method. TQ includes systems, methods, and tools. The systems permit change: the philosophy stays the same. TQ is anchored in values that stress the dignity of the individual and the power of community action.
The Japanese adopted Feigenbaum’s concept and renamed it companywide quality control. Five aspects of total quality control (Wyne S.R., 1987) practiced in Japan are as following:

1. Quality emphasis extends through market analysis, design, and customer service rather than only the production stages of making a product.
2. Quality emphasis is directed towards operations in every department from executives to clerical personnel.
3. Quality is the responsibility of the individual and the work group, not some other group, such as inspection.
4. The two types of quality characteristics as viewed by customers are those that satisfy and those that motivate. Only the latter are strongly related to repeat sales and a “quality” image.
5. The first customer for a part or piece of information is usually the next department in the production process.

The Three Dimensions Of Quality:
Quality of design→ Conformance→ performance: This process (Gitlow, H., 1989) considers quality as a ‘never ending’ improvement of a firm’s extended process. The process starts with the customer and ends with the customer as follow:

- Quality of design: This is the degree of achievement of purpose by the design itself. It starts with market research, sales feedback analysis and continues to development of a product/service that would satisfy the customer.
- Quality of conformance: It is the extent to which a firm, its processes and it’s suppliers are able to surpass the design specifications required to serve the needs of the customer.
- Quality of performance: This identifies the extent to which customers needs are satisfied by performance of a product/service over a period of time. This takes into account customer opinions, market research input, feedback from sales representatives, use of after sales service, warranty claims, services such as support and backup, emergency calls for maintenance and repair etc. It is the link in the extended process and information generated can be fed back to re-examine the Quality of design and Quality of conformance. The process is dynamic and can be continually improved.

Quality has been shown to contribute to greater market share and return on investments (Cole, 1992) as well as lower manufacturing costs (in long term) and improved productivity (Garvin,
1983). For a company or country to compete effectively in the global economy, its products must meet a certain standard of quality. Distribution of inferior products – on any consistent or systematic basis – can be damaging to long term reputation of both firms and nations, both at home and abroad, and can have severe implications for balance of payments (Scagoline, 1988).

1.2 Quality Control (QC):
QC has been defined (Dale, B.G., Plunket, J.J., 1990) as, ‘operational techniques and activities aimed both at monitoring a process and eliminating causes of unsatisfactory performance of relevant stages of quality loop in order to result in economic effectiveness. American Society of Quality Control (ASQC) defines QC as ‘the operational techniques and activities which sustain a quality of product or services that will satisfy given needs’. QC is, therefore, use of techniques, mainly statistical, to achieve, maintain and try to improve on quality standards of products and services. The principles of QC are based on following stages:

**Figure 2: Stages of QC**

![Diagram of Quality Control stages]

1.3 Statistical Quality Control (SQC):
It uses various statistical distributions to measure the degree of conformance of raw-materials, process control charts for on-stream monitoring and acceptance sampling plans at incoming and outgoing stages for both attributes and variables.

1.4 Total Quality Control (TQC)
TQC has been described (Hohner, G., 1988) as: ‘a management framework to ensure continuing excellence’. This management framework was suggested to include the following statements for action:

I. TQC is a business philosophy which groups together manufacturing, engineering, marketing and sales amongst others, linked together by a two way flow of information.

II. TQC is considered as a mind-set to approve only criteria leading to better than acceptable quality via the use of continuous improvement.

III. TQC provides reliability and consistency in the delivered product/service as a check and balance system. The current standards present the opportunity for achievement of new and higher targets (standards).

TQC is a unique concept in business management style (Sohal, A.S., Tay, G.S., & Wirth, A., 1989) that involves every member of any business organization from the top executive to the person on the lowest rung of the organizational hierarchy, in solving quality, cost and production problems. This concept is referred to as company wide quality control (CWQC) in Japan. The emphasis of CWQC is on total control of quality organization wide and looks at the process of serving customers chain (both internally and externally). TQC has been described as statistical control of quality applied to the total operation of an organization, including all steps of planning, design, production service, marketing, finance and administration so as to produce dependable goods and services at a low cost suited to the market.

1.5 Quality Assurance (QA)

QA is nothing but TQC conducted in a systematic manner. The American Society for Quality Control defines QA as, ‘QA contains all those planned and systematic actions required to provide adequate confidence that a product or service will satisfy given requirements for quality’. QA thereby means that there is set of documentations or a system which demonstrates the existing standards of quality and reliability. QA rejects inspection as the answer to quality problems and encourage implementation of procedure at all stages in the process in order to comply with set standards using SQC. Quality assurance requires (Crosby, 1979; Deming, 1982, 1986; Garvin, 1983, 1984) that adequate and appropriate measures are taken from product design through manufacture and delivery to customer. Quality has to be designed into the product (Gilbert, 1990; Gibson, 1990; Gryna, 1991; Juran, 1986, Leonard and Sasser, 1982) through right design specifications by considering manufacturability, design reviews, etc. Divisions,
departments and even individual workers must be able to monitor their respective processes and systems in a meaningful way to maintain the designed quality and to make continuous improvements in quality.

1.6 Total Quality Management

The TQM concept refers to company wide quality assurance (Oakland, J.S., 1989) from supplier to customer (external and internal) using systems approach of documented sets of procedures and control of process variability in a team spirit with top management commitment. Since it also involves strategic quality planning, goal setting, market research, design reviews and participation of senior management, it is, in other words, a strategic quality management.

TQM has been defined (Besterfield, 1995) as both a philosophy and a set of guiding principles that represents the foundation of a continuously improving organization. It integrates fundamental management techniques, existing improvement efforts and technical tools in a disciplined approach. Berry (1991) defined the TQM process as a total corporate focus on meeting and exceeding customer’s expectations and significantly reducing costs resulting from poor quality by adopting a new management system and corporate culture.

The evolution may continue and TQM may soon be transformed into ‘Total Business Management’ or ‘Total Market Leadership’ framework depending on growth and reliance on role of quality. It is an ongoing process and there is no limit to striving for excellence in order to attain global competitiveness. In fact, a latest concept of TQM II has emerged (Stein, R.E., 1994) which refers to continuous profitability improvement through Total Quality Management.

A management approach that ensures mutual co-operation of everyone in an organization and associated business process, to produce products and services that meet and exceed, the needs and expectations of customers.

2. Characteristics Of Total Quality

It is now well known (Perfect Machine Tools, 1986, Bureau of Indian Standards, 1991) that quality has to be ‘built-into’ and not ‘inspected-into’ the product right from the quality at source to quality in manufacturing process and finally quality in customer’s hands. That is the quality flows through different stages of the ‘quality loop’.

Figure 3: The Total Quality Loop
This conceptualizes the so-called ‘total quality’ which is an outcome of flow of quality (Lal, H., 1990) through different activities namely marketing, design-engineering, purchasing, manufacturing-engineering, manufacturing supervision and shop operation, inspection and testing, distribution, installation and servicing to customer. ‘Total Quality is the driving force to value creation (Danworth, D.D., 1986), across all elements of any successful business. Nothing is more important to our survival and prosperity than quality’.

Seven characteristics of managing Total Quality (TQ) have been described (Feigenbaum, A.V., 1988) by leading quality experts of General Systems Company Inc. USA. These are:

1. Total Quality is not a technical function or department but a systematic process that extends throughout the company.
2. Total Quality must be organized to recognize that while it is everybody’s job in the company, it will become nobody’s job unless quality process in the company is correctly structured to support both the quality work of individuals and the quality teamwork among departments.

3. Total Quality improvement must take place in marketing, development and engineering, in manufacturing and particularly in service not merely in production for factory workers only.

4. Total Quality must be perceived to be what the buyer wants and needs to satisfy his requirements- not what the company needs to satisfy his requirements for marketing and production efficiency.

5. Total Quality improvement requires applications of new technology ranging from quality design techniques to computer-aided quality management measurement and control.

6. Total Quality improvement is achieved only through the help and participation from all the men and women in the work force-not from just a few specialists.

7. For Total Quality attainment, company has to establish a clear, customer-oriented, quality management system throughout the organization which people can understand, believe in and want to be part of.

3. Total Quality Management: Existing Models

Total Quality Management is the management of quality completely. Quality Management has been described by ISO as that aspect of the overall management function that determines and implements quality policy and as such is the responsibility of top management. (ISO 8402: 1986).

Fig 4: TQM- An Integrated Organizational System’s View
TQM is viewed as a system to integrate various aspects of the organisation’s activities whereby human resources are driven by the same commitment, shared beliefs and objectives in mind.

**The continuous Improvement:** TQM has been defined (Pfau, L.D., 1989) as a philosophy based on quest for progress and continual improvement in the areas of cost, reliability, quality, innovation, efficiency and business effectiveness in a perseverant manner. The main driving force is belief and commitment with strategic and operational objectives as outputs. TQM has been described as ‘an approach for continuously improving the quality of goods and services delivered through the participation of all levels and functions and the organizations.

### 3.1 Oakland Model:

The Oakland model (Oakland, J.S., 1989) describes TQM as a pyramid representing five distinct components:

- Management commitment
- Customer-supplier chains
- Systems approach of documented sets of procedures and standards
- SPC (Statistical Process Control) tools
- Team work and continuous improvement

At the heart of the model is the establishment of customer-supplier chains where the interplay of supplier and customer processes determines the strategy for continuous improvement through process feedback and customer feedback.

Oakland has enumerated following thirteen stages to represent a gradual progression towards implementing a TQM based culture.
- Understanding quality
- Commitment to quality
- Policy on quality
- Organisation for quality
- Measurement costs of quality
- Planning for quality
- Design for quality
- System for quality
- Capability for quality
- Control for quality
- Team work for quality
- Training for quality
- Implementation of TQM

Figure 5: The Oakland Model (Oakland, 1989)
3.2 **Integrated Model of TQM**: Sohal, Tay and Wirth (1989) have discussed quality in terms of TQC rather than TQM but refer control to the management of quality at various stages of the process. There are five elements in this model:

- Customer (internal and external) focus
- Management commitment
- Total participation; Total employment Involvement (TEI)
- Statistical Quality Control
- Systematic problem solving process;
- Plan-Do-Check-Act (PDCA) cycle

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**Figure 6: The Integrated Model of TQM (Sohal, Tay & Wirth, 1989)**
3.3 The building blocks model of TQM (Zairi, M., 1991): Zairi at the Management Centre of Bradford University has proposed three kinds of building blocks to discuss total quality:

The Foundation of Total Quality (TQ): Three elements of foundational block of TQM have been identified:

- Continuous Improvement
- Value addition at each stage of every operation
- Employee Involvement

Figure 7: TQM Model Proposed by Zairi (1991)
The Pillars of Total Quality (TQ): These are the means by which the human creativity inputs can be converted into outputs which benefit the end customer. The pillars are represented by various quality systems which represent procedures, documentation, use of statistical process Control (SPC), management control system, process flexibility provided by use of computers, workplace design, ergonomics and customer-supplier(both internal and external) chain.

The Top of Total Quality (TQ): This top most building block should shield the organization from adverse external factors and protect it all the time. This top part should be weather proof (not affected by adverse changes in market place) and should not determine (organizations are dynamic in nature and have to adapt to new market patterns). The activities of senior managers, therefore, should aim towards “Quality planning, Leadership, and Vision” for world class competitiveness.