

**A STUDY OF THE IMPACT OF  
ISO 9001:2000 ON QUALITY MANAGEMENT PRACTICES IN  
SELECTED ORGANISATIONS IN KERALA**

*Thesis submitted to the*

**Cochin University of Science and Technology**

*In partial fulfilment of the requirements for the Award of the*

*Degree of*

**DOCTOR OF PHILOSOPHY IN MANAGEMENT**

*Under the Faculty of Social Sciences*

*By*

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*January 2010*



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## Certificate

*Certified that the thesis "A Study of the impact of ISO 9001:2000 on Quality Management Practices in Selected Organisations in Kerala", submitted to the Cochin University of Science and Technology for the award of the Degree of Doctor of Philosophy in Management under the Faculty of Social Sciences, is the record of bonafide research done by Sri. Unnikrishnan Kartha N. R., under my supervision and guidance. The thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar type of recognition.*

Place: Kochi

Date: 13/01/2010

  
Dr. Jagathy Raj V. P.  
Research Guide

## *Declaration*

I hereby declare that this thesis, *“A Study of the impact of ISO 9001:2000 on Quality Management Practices in Selected Organisations in Kerala”*, submitted to the Cochin University of Science and Technology for the award of the Degree of Doctor of Philosophy in Management under the Faculty of Social Sciences, is the record of bonafide research work carried out by me under the supervision and guidance of Dr. Jagathy Raj V. P., Reader, School of Management Studies, Cochin University of Science and Technology, Kochi-682 022. This thesis has not been submitted earlier anywhere else for the award of any degree, diploma, associate ship, fellowship or other similar title of recognition.

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## **1.1 Introduction**

The highly demanding and ever-changing business environment, especially after the liberalisation, privatisation and globalization, has necessitated the organizations to be astute in the competitive market, offering products and services of superior quality. Such products and services enable them to attract new customers and strengthen their relationship with the existing ones. Timely adoptions of technological innovations have served to break the geographical boundaries, resulting in more informed and demanding customers than in yester years. Increased pressure from the customers, competitors and the environment is forcing the managements to implement strategies for lowering the operating costs and improving efficiency, without compromising quality.

The definition of quality has changed over a period of time with the changing needs and requirements of the customer. But the objective has more or less been the same, to develop an approach for problem solving and conform it to standards for achieving customer delight. With management functions getting more complex, maintenance of quality in functional areas is becoming increasingly challenging.

Organisations, which have successfully implemented ISO 9001:2000, always promote customer relations, and quality is closely knitted in their corporate strategy. An organisation is a system of interrelated units, and for ISO 9001:2000 to succeed in all the entities within the organization, all the

units have to be involved totally. In the initial stages, organisations used to implement ISO 9001:2000, on the assumption that improvement in the shop-floor activities would solve all existing productivity and quality problems. Later they realized that ISO 9001:2000 was much more than just shop floor improvements.

TQM (Total Quality Management) is a management approach originated in 80's in developed countries. It is considered a revolutionary step forward to improve business efficiency it redefines quality and upgrades its importance within the company. The top management is involved totally and stands committed. Under TQM, everybody becomes a quality leader. The customer defines quality, and the requirements of the customers are treated very seriously and these are met promptly and satisfactorily. The working level personnel are empowered and this enables them to carry out innovations which will help eventually to reduce scrap, rework and cut costs. Everyone works towards a common goal. Training imparted to the top management makes identification of critical success factors of the organization easy.

IS/ISO 9001:2000 defines the terms Management Commitment, Customer Focus, Quality Objectives, Product Realization, Customer Communication, Monitoring and Measurement, Customer Satisfaction, etc., in its Quality Management Systems Manual. These critical dimensions lay the foundation for a transformational orientation to achieve a culture of sustainable improvement, so as to have competitive advantage on a continuous basis. Quality management systems such as ISO 9001:2000 have proved that building quality into every sphere of activity, whether it is a manufacturing process or providing service, is very fundamental, and that those who believed in this philosophy reached high levels of excellence. This is further corroborated by Wali et al. (2003) and Sila and Ebrahim Pouri (2003).

Re-engineering, benchmarking, ERP, e-business, and e-commerce are also quality management tools. If any organisation adopts similar practices, it is likely to become competitive, sooner or later. It is an accepted fact that one could make an organisation competitive, provided the basic quality features required to run a business are in place. Going through the ISO 9001:2000 route might take a longer time, but it will ensure a strong work culture, as quality is built in the system itself.

## **1.2. Theoretical concepts of quality**

A fairly elaborate review of literature was done to familiarise the works carried of the doyens in the field. The following subsections present the main principles and practices of quality management systems put forward by various pioneers in the quality movement, across the globe.

### **1.2.1 Deming's approach to the quality management system**

Hubert (2000) has detailed the theoretical approach of Deming (1986) in respect of the quality management system, and it envisages the creation of an organizational system that fostered cooperation and learning to facilitate the implementation of process management practices. This, in turn, leads to the Continual Improvement of the processes, products, and services and help to instill employee satisfaction. These are critical to promote customer focus, and ultimately help the survival of any organisation.

Anderson et al. (1994) and Deming (1986) highlight the responsibilities of the top management to take the lead in changing the processes and systems. Leadership plays an important role in ensuring the success of quality management, because it is the top management's responsibility to create and communicate its vision to enable the organisation to accept and adopt continual improvement. The Top Management should also take the leadership of ideas, to

implement the already documented and decided policies, and to ensure a professional quality culture across the organisation.

Deming (1986) emphasises the importance of the identification and measurement of customer requirements, creation of supplier partnership, utilisation of functional teams to identify and solve quality problems, enhancement of employee skills, participation of employees, and continual improvement.

Anderson et al. (1994) also have developed the theory of quality management underlying Deming's management techniques. They propose that the effectiveness of these arises from the leadership efforts towards the simultaneous creation of a collaborative and learning organization to facilitate the implementation of process management practices. Quality management also enhances Customer Satisfaction and ensures organisational survival through sustained employee fulfilment and Continual Improvement of processes, products and services.

Improvement of quality depends on the ability to control and manage the systems and processes properly, and in fixing the role of management responsibilities in achieving this. Deming (1986) advocates methodological practices, including the use of specific tools and statistical methods in design, management and improvement of processes, aimed at reducing the inevitable variation that occurs from common causes and special causes in production. The common causes of variations are systemic in nature and are shared by many: operators, machines, and products. These include poor product design, non-conforming incoming materials, poor working conditions, etc., and are to be addressed by the top management. The special causes relate to lack of knowledge or skill, or poor performance. These are related to the employees. Deming (1986) proposes 14 points as the principles of

QMS (Quality Management System) which have been quoted by Hubert (2000), as shown below:

- a. Create constancy of purpose towards improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
- b. Adopt the new philosophy for a new economic age through the management learning their responsibilities, and taking leadership for change.
- c. Stop dependence on mass inspection to achieve quality. Eliminate the need for mass inspection by building quality into the product in the first place itself.
- d. Stop awarding business on the basis of price; instead, minimize total cost and move towards a single supplier for a specific item.
- e. Constantly improve the system of production and service, to enhance quality and productivity, and to achieve reduction in cost.
- f. Institute on the job training.
- g. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job and overhaul supervision of management and production of workers.
- h. Drive out fear so that all may work in an absolutely hassle-free atmosphere.
- i. Break down barriers between departments: research, design, sales, and production must work as a team, to foresee and tackle problems in production.
- j. Eliminate slogans, exhortations, and numerical targets for the workforce, such as zero defects and new productivity levels. Such exhortations distract the attention from the main issues.

- k. Eliminate quotas or work standards and management by objectives and numerical goals on the factory floor; substitute by leadership.
- l. Remove barriers that rob the personnel of their right to pride of workmanship for hourly workers, management and engineering; eliminate annual or merit ratings and management by objective.
- m. Institute a vigorous programme of education and self- improvement.
- n. Encourage and guide everyone in the company to work to accomplish this transformation.

### **1.2.2 Juran's approach to the quality management system**

As per Hubert (2000), it is a system of activities directed towards attracting delighted customers, promoting empowered employees, aiming for higher revenues and arriving at lower costs. Juran believes that the main quality problems point to the management rather than to the workers and that quality can be attained only by making the functions and activities efficient and effective. Organisation-wide assessment of quality, supplier quality management using statistical methods, quality information system, and competitive benchmarking are essential to achieve excellence in quality. Juran's approach emphasises team work (quality control circles and self-managing teams) which can promote improvement, establish better communication between management and employees, and improve coordination among the employees. He also brings out the importance of top management commitment, empowerment of employees, their participation and recognition, and rewards for their outstanding contribution.

Juran observed that it is very important to understand the customers' needs. This requirement applies to all those who are involved in marketing, design, manufacture, and services. Identifying the needs of the customers requires a systematic analysis, and a concrete action has to be taken to ensure

that the product meets their needs and is fit for its intended use. It is not enough if it meets the product specifications alone. A well-planned market research can meet this objective. In order to ensure the quality of the design, he proposes the application of techniques such as quality function deployment, experimental design, reliability engineering, and concurrent engineering. Juran considers quality management through three basic processes (Juran Trilogy): quality control, quality improvement, and quality planning. In his view, the approach to managing the quality consists in detecting and acting upon the inadequacies, through the process of quality control. This requires application of a different process like quality improvement. The inadequacies can be attributed to the deficiency in the planning process.

Juran defines a universal sequence of activities for the three quality processes, which are listed in Exhibit 1.1 and specifies the four broad categories of quality costs, which can be applied to evaluate the costs incurred by an organization, on account of maintaining quality. Such information is very valuable for controlling the cost. The four quality costs are: internal failure costs due to scrap, rework, failure analysis, etc., which are associated with the defects found prior to the transfer of the product to the customer; external failure costs on account of the warranty charges, complaint adjustment, returned material, allowances, etc., which relate to the defects found after the product is shipped to the customer; appraisal costs as a net result of the incoming, in process, and final inspection and testing, product quality audits, maintaining accuracy of testing equipment, etc., which are incurred while determining the degree of conformity to the quality requirements, and finally prevention costs contributed by quality planning, new product review, quality audits, supplier quality evaluation, training, etc., which get accumulated in the

process of keeping failure and appraisal costs to a minimum. The universal processes for managing quality can be detailed as given in Exhibit 1.1

Quality planning	Quality control	Quality improvement
Establish quality goals	Choose control subjects	Prove the need
Identify customers	Choose units of measure	Identify projects
Discover customer needs	Set goals to organize	Project teams
Develop product features	Create a sensor	Diagnose the causes
Develop process features	Measure actual performance	Provide remedies which are effective
Establish process controls transfer to operation	Interpret the difference; Take action on the difference	Deal with resistance to change control to hold the gains

Source: Paper presented at the ASQC 40<sup>th</sup> Annual Quality congress, California May 1996 by J.M. Juran

### Exhibit 1.1: Universal Approach to Managing for Quality

#### 1.2.3 Crosby's Approach to the quality management system

Crosby (1979) identifies a number of important principles and practices for a successful quality improvement programme, which included management participation, management responsibility for quality, employee recognition, education, reduction of the cost of quality (prevention costs, appraisal costs, and failure costs), emphasis on prevention rather than, after- the- event inspection, doing things right the first time, and zero defects. Crosby states that mistakes are caused by two reasons, lack of knowledge and lack of attention. Education and training can eliminate the first cause and a personal commitment to attention to detail and attention to detailing the second. He also stresses

the importance of the management style to have a successful quality improvement. The key to quality improvement is to change the thinking of the top level managers and make them not accept mistakes and defects, as this would in turn reduce the expectations and the standard in their jobs.

Crosby also presents the quality management maturity grid, which can be used by the organisations to evaluate the maturity of their quality management. The five stages in the grid are: uncertainty, awakening, enlightenment, wisdom and certainty. These stages can help to assess progress in terms of parameters such as attitude, present quality, problem handling techniques, cost of quality as a percentage of sales, and summation of the status of quality of an organisation. The quality management maturity grid and the cost of quality measures are the main tools for managers to evaluate the level of quality. He offers a 14-step programme that can guide organizations to pursue quality improvement. Hubert (2000) has summarized these steps as follows:

- a. Make it clear that management is committed to quality
- b. Form quality improvement teams with senior representatives from each department
- c. Measure processes to determine where current and potential quality problems lie
- d. Evaluate the cost of quality and explain its use as a management tool
- e. Raise the quality awareness and personal concern for all the employees
- f. Take actions to correct the problems identified through previous steps
- g. Establish process monitoring for the improvement process
- h. Train supervisors to actively carry out their part of the quality improvement programme
- i. Hold a “Zero Defect Day” to let everyone realise that there has been a change and to reaffirm the management commitment.

- j. Encourage individuals to establish improvement goals for themselves and for their groups
- k. Encourage employees to communicate to the management the obstacles they face in attaining their improvement goals
- l. Recognise and appreciate those who participate.
- m. Establish quality councils to communicate on a regular basis
- n. Do it all over again, to emphasise that the quality improvement programme never ends

### **1.2.4 Feigenbaum's approach to the Quality Management System**

Hubert (2000) has reiterated the thoughts of Feigenbaum, the originator of Total Quality Control (1985), who argues that quality needs to be applied to all the stages. He also considers human relations as a basic issue in quality control activities. The following ten benchmarks are defined for total quality:

- a. Quality is a companywide process
- b. Quality is what customer says it is
- c. Quality and cost are a sum, and not difference
- d. Quality requires both individual and team zealotry
- e. Quality is the way of managing
- f. Quality and innovation are mutually dependent
- g. Quality is an ethic
- h. Quality requires continual improvement
- i. Quality is the most cost-effective and least capital-intensive route to productivity
- j. Quality is implemented with a total quality system connected with the customers and suppliers.

These ten points provide the organization the necessary foundation for implementation of its international quality leadership.

### **1.2.5. Ishikawa's approach to the Quality Management System**

Ishikawa pays special attention to the statistical techniques used in the industry (1984). He emphasises the need for effective data collection and presentation, use of Parato diagrams, and cause and effect diagrams to prioritise quality improvements. He is of the opinion that quality means not only the quality of the product, but also the after-sales management of the company itself and the human beings working there. Hubert (2000) has consolidated the effects of Ishikawa's approach as follows:

- a. Product quality gets improved and becomes uniform, and thereby defects are reduced.
- b. Reliability of goods is improved.
- c. Cost is reduced.
- d. Quality of production is increased and it becomes possible to make rational production schedules.
- e. Wasteful work and rework are reduced.
- f. Expenses for inspection and testing are reduced.
- g. Contracts between vendor and vendee are rationalized.
- h. The sales market is enlarged.
- i. Better relations are established between departments.
- j. Generation of false data and false reports is reduced.
- k. Discussions are carried out more freely and democratically.
- l. Meetings are conducted more smoothly.
- m. Repairs and installation of equipment and facilities are done more rationally.
- n. Human relations are improved.

### **1.2.6 Conclusions derived from the review of the thoughts of quality leaders**

1. Top management plays a crucial role in the success of quality management.
2. Identification of quality problems and involvement of employees depend to a very great extent on the effective functioning of the cross-functional teams (CFT). This also helps to break down the barriers between departments.
3. Self-improvement should become a part of a good quality management practice.
4. Identifying the customer requirements as well as ensuring that the product or service meets the intended use, is a mandatory requirement of any quality management practice.
5. Quality costs such as internal failure costs, external failure costs, appraisal costs and prevention costs, are to be given serious attention to ensure quality.
6. Recognition of the employees for the good work done, implementation of programmes such as, on-the-job training, quality improvement, cause and effect analysis, etc., will culminate in quality products and services.
7. Prevention of poor quality rather than detecting it after it occurs, can save a lot of time and effort.
8. Total quality control (TQC) covers the full scope of the product and service life cycle, right from the product concept through production and customer service.
9. Quality is everybody's job, and training focused on quality attitudes, quality knowledge, and quality skill influences the level of quality in an organisation.

10. Improvement is continual in nature and this is essential for maintenance of quality.
11. Fact-based management systems ensure implementation of allround quality

The research questions and objectives in turn are closely knitted to these fundamental concepts of quality.

### **1.3 Background of the research work**

The literature review undertaken for this study has given different views on the usefulness of the implementation of ISO 9001:2000. Some of the reports have brought out the benefits of ISO 9001:2000. Athul (2000) mentions in his study of the industries in India that a significant positive difference exists in ISO 9001:2000-certified organizations in comparison to those which are not certified for quality in the specific areas of training, team building, quality improvement programmes and strategic planning. Sachdeva et al. (2007) have reported that ISO 9001:2000 implementation has become a critical factor for the Indian companies for their existence. The findings of the study are that the organisations have been able to improve their performance in the specific areas of organizational performance, cost of quality, schedule of supply and procurement by implementation of this quality standard. James (2007) has confirmed the benefits of ISO 9001:2000 implementation to organisations for sustained product quality, enhanced market image, increased Customer Satisfaction, etc. His further study on the improvement of organizational climate on account of ISO 9001:2000 implementation has shown substantial improvement of climate motives such as achievement, expert influence and extension. Implementation of quality management systems, such as ISO 9001:2000, has improved Customer Satisfaction substantially across various industrial settings as per Mehra and Ranganathan (2008).

There are also reports which have indicated that ISO 9001:2000 implementation did not bring out positive results. The study of Henricks (1992) reports the bankruptcy of Wallace Co., a Baldrige Award winner. The case of Wallace getting into a financial problem is reported also by Zurier Steve (1992) ([url.http://www.highbeam.com/doc/IGI-11818720.html](http://www.highbeam.com/doc/IGI-11818720.html)). Restructuring of Florida Power and Light a Deming Prize winner, on account of financial difficulties has been quoted by Main (1991). Garvin (1991) has mentioned the financial pressures faced by Baldrige winners, Motorola, Federal Express and Cadillac since receiving the MBAQN Award. Lamprechet (1992) states that ISO 9001:2000 does not guarantee a quality product; it only guarantees a set of documents attesting to the quality practice of the company. In a research study of North American companies, Shannon et al .(1998) conclude that ISO 9001:2000 certification was obtained by companies only as a credible public signal of effective quality management practice and firms with a small number of large customers did not go for this as there were better alternatives for achieving quality. Other major research studies which give indications that the acquisition of ISO 9001:2000 certification has not improved quality in real terms are those reported by Mahadevappa and Korteswar (2004) and Rajbir et al .(2006) .

#### **1.4. Formulation of the problem**

The present study attempts to compare the findings of the earlier researchers quoted in the literature review, with the observations of the research scholar in respect of Quality Management Systems followed in selected organizations in Kerala. This formed the basis for this work, which aims at assessing the impact of ISO 9001:2000 certification on the Quality Management Practices in ISO 9001:2000 certified organizations as well as in those not certified by this standard, through the perception of the employees. This study is hoped to bring out the factors which influence the impact of

ISO 9001:2000 on quality management practices in the selected organizations in Kerala.

### **1.5. Scope of the study**

The present study attempts to evaluate the quality management practices followed in 24 selected organisations in Kerala, from multiple units dealing with aerospace hardware, glassware, rubber products, health care products, civil construction, etc. These include 12 organisations which have implemented ISO 9001:2000 and the rest which have not gone for this quality certification.

### **1.6. Objectives of the study**

**The objectives of the present study are:**

- i. To evaluate and compare the level of the existence of Top Management Commitment in the quality management practices of ISO 9001:2000- certified organizations and in those which are not certified by this standard.
- ii. To investigate the extent of Employee Involvement in ISO 9001: 2000-certified organisations as well as in those which are not ISO 9001:2000-certified, and draw comparison between these.
- iii. To assess the existence of Team Working in both the categories of organizations certified and not certified by ISO 9001:2000 and compare the extent of this variable.
- iv. To evaluate the status of Continual Improvement in ISO 9001: 2000- certified organisations and in those which do not have a quality certification, and strike a comparison.

- v. To verify whether the thrust on internal communication in ISO 9001:2000-certified as well as not certified organizations is comparable.
- vi. To check the extent of Customer Satisfaction prevalent in the case of ISO 9001:2000-certified organisations and compare with that in those without certification.

### **1.7. Research questions**

- i. Are the quality management practices in ISO 9001:2000 certified organizations and in those which are not certified by ISO 9001:2000 standards, comparable when looked at from the point of view of the dimensions of quality management such as Top Management Commitment, Employee Involvement, Team working, Continual Improvement, Internal Communication and Customer Satisfaction?
- ii. What similarities or dissimilarities are observed in the two types of organisations in respect of these quality dimensions?
- iii. What conclusions could be derived from these observations?
- iv. If there are significant differences between the two categories, what can these be related to?

### **1.8. Hypotheses of the study**

The hypotheses of the study are derived, based on the assumption that quality is seemingly better in ISO 9001:2000 certified organisations compared to that in organisations which do not have quality certification. These are listed below:

**Hypothesis 1:** Top Management Commitment is higher in ISO 9001:2000-certified organisations, compared to that in those not certified by this standard.

**Hypothesis 2:** ISO 9001:2000 certified organisations display a higher level of Employee Involvement in comparison with that seen in organisations which are not qualified by this standard.

**Hypothesis 3:** Better Team Working exists in ISO 9001:2000-certified organizations, compared to that in organizations not certified by this standard.

**Hypothesis 4:** ISO 9001:2000 certified organizations practise Continual Improvement more meticulously in comparison to those which are not certified by this standard.

**Hypothesis 5:** ISO 9001:2000 certified organizations put higher thrust on Internal Communication compared to those which are not certified by this standard.

**Hypothesis 6:** Customer Satisfaction is higher in ISO 9001:2000 certified organizations in comparison to what is practised by organizations which do not have this certification.

## **1.9 Chapterisation Scheme**

The thesis is organised under seven chapters.

The first chapter provides an *introduction to the study*. It includes the statement of the problem, objectives, hypotheses, research design, concepts and definitions, and organization of chapters.

The second chapter focuses on *the reviews, and the relevant literature of the studies in this field carried out by various researchers in the past*.

The third chapter titled *Significance of Quality Management Systems - Theoretical Perspectives*, highlights the issues related to the evolution and practice of these systems in organisations in India in general and in the business units of Kerala in particular.

The fourth chapter discusses the *research design, the analytical frame-work and data collection*. The various tests conducted are described in detail.

The fifth chapter deals with the *analysis and interpretation* of the data collected during the process of study.

The sixth chapter presents the *summary of the study and findings*.

The seventh chapter gives an account of the *conclusions emerging from the study*.

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**REVIEW OF LITERATURE**

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The objective of the research work is to study the level of existence of the quality dimensions such as Top Management Commitment, Employee Involvement, Team Working, Continual Improvement, Internal Communication and Customer Satisfaction in ISO 9001:2000 certified organizations, and compare these dimensions with those in organizations which are not certified by ISO 9001:2000. The review of the literature is undertaken to learn from the experience of the previous researchers in this specific and related areas of quality. Publications by them in the various areas of quality management practices in respect of organizations which are certified and not certified by ISO 9001:2000, methods of evaluation of quality dimensions and their attributes and analytical tools used have been referred to as part of literature review.

Carmines and Zeller (1979) have given an account of the establishment of reliability and validity of the tool used for research. Measurement becomes valid, when what is expected to be measured is actually obtained from the data. Reliability is assured if the measurement produces the same result consistently. Measurement can be reliable even if it is not valid (if consistently wrong results are obtained). However there cannot be a valid measurement if there is no reliability.

Crosby (1979) has asserted that the following wrong assumptions may be removed from the minds of the quality practitioners: Quality is not goodness or luxury, or shininess; it is not intangible and therefore not measurable; it is

not unaffordable, not originated by the workers, not something that originates in the quality department; and quality is not conformity to requirements. He further adds that quality is the responsibility of everyone in the organisation and that quality is measurable. The process of instilling quality improvement is a never-ending phenomenon.

Deming (1986) has commented that globalisation of the market economies has urged corporates in all the sectors to concentrate on maintaining a sustainable competitive edge, which is directly related to the upkeep of quality, both in terms of the services as well the products. An effective model of such a visible success is the quality management system which is Customer-Centric in its nature. Well-defined management policies which help to deliver quality products and services ensure the participation of employees as well as that of the management. It is a management strategy to generate the awareness of practice of quality in all organisational processes. QMS encompasses quality circles, which ensure togetherness through the concerted effort of the workforce from different departments, in order to improve the production and reduce the wastage.

Crosby (1991) has proposed a 14-step, zero-defect quality improvement programme, for the overall uplift of quality. The main emphasis of this pioneer in quality studies is on top management leadership, supplier quality management, process design and control, employee training and employee involvement.

Main (1991) has reported about the restructuring of Florida Power and Light, a Deming prize winner, on account of financial problems.

Garvin (1991) has described three MBNQA (Malcolm Baldrige National Quality Award) winners - Motorola, Cadillac and Federal Express - which had been under temporary financial pressure after receiving the award.

Zurier (1992) mentions the present negative financial reports of the MBAQN award winner, Wallace Co, which had fallen into bankruptcy.

Henricks(1992) has also referred to the financial difficulties faced by Wallace Co.

Lamprecht (1992) has opined that ISO registration does not guarantee quality and it attests the quality practice of the company

Richard (1992) views that with the advent of total quality management (TQM), seeds of change have been sown in the traditional roles of the top executives. Facilitating the team members to take appropriate decisions is as important as setting unique strategies, aiming at high-level numerical goals and monitoring the performance achieved vis-a-vis the goals set. The unique exercise of adopting a strategic leadership programme in a TQM environment requires facilitating the implementation of the right decisions by the subordinates in the direction of accompany- wide total quality improvement.

Lu and Sohal (1993), based on their study on Australian organizations, have listed the factors that are likely to contribute to the success of QMS implementation. Identification of the strategic direction of the business, i.e., of the senior management having a clear and uniform understanding of the mission, vision and policies of the organization, is very important. Understanding the customers' expectations and communicating the same throughout the organisation is essential to achieve customer satisfaction and eventually customer delight. A well-defined plan for the implementation of a Quality Management System, in terms of the time frame, resources, training

and supportive organisational structure, is necessary to achieve success. The infrastructure for this system will consist of a steering committee, strengthened by one or more layers of improvement teams. This committee has the responsibility to plan the implementation and monitor its progress. The teams carry out the improvements and report the results. It is seen that some organizations encourage participation from the lower levels of management, especially from the shop floor, to enhance employee involvement. Each improvement team has to have a sponsor, usually a senior manager. This linkage assures senior management commitment and provides ownership to the improvement teams. These organisations lay their focus on “train the trainer concept” which requires participants to train their own staff eventually. Adopting quality assurance systems like ISO 9001: 2000 and the use of external consultancy wherever required, give an impetus to the implementation of quality systems.

Easton (1993), in an article, has assessed the current state of the American quality management based on the author's experience in evaluating 22 companies as an examiner for the Malcolm Baldrige National Quality Award during the past four years. The companies that apply for the award possess much strength and foster substantial improvement in customer satisfaction, employee involvement, and operational results. However, they also have many identifiable areas which need improvement.

Goh and Ridgway (1994) present the results of a study which examines the implementation of total quality management in small, and medium- sized manufacturing companies. The study is based on personal, structured interviews with the senior managers responsible for quality in 30 manufacturing companies in the Sheffield area. It identifies five major components of TQM

and assesses the performance of the companies with respect to these components.

Hauser et al. (1994), while introducing incentive schemes for enhancing customer satisfaction, have given explanations as to how and when this is profitable and offer several recommendations for improving upon the current practices. Employee groups (including managers) may have shorter time horizons than the organization itself, and the systems enable an organization to use customer feed-back, to monitor implicitly how employees could allocate their efforts for meeting the short-term and long-term goals. These systems can be used to encourage employees to make tradeoffs that are in the best interests of the firm.

Recommendations for revamping the current practices included: measuring the satisfaction of the present customers, former customers, and potential customers; measuring the satisfaction with competitors' products; better the performance of employee groups. When different customer segments have different switching costs or these vary in the precision with which their satisfaction can be measured, the segments are measured separately and different weights are assigned in the incentive plan.

Lakhe and Mohanty (1994) identify some of the major factors of a good quality management system as team work and participation, statistical methods and analysis, problem solving, communication, behavioural and cultural change, customer care, motivation for timely implementation, responsibility and accountability, and real time information system. Many authors have emphasised different sets of organisational requirements as imperatives for the successful implementation of quality. However, these prescriptions are not based on organisational diagnosis; these are empirical findings on the other hand, founded upon judgments, conjectures and practical experiences.

Anderson and Shoal (1999) have given a detailed account of the relationship between quality management practices and business performance in small business.

Zairi (1994) has identified process flexibility, workplace design, user-supplier chain and management control system as the pillars on which the quality system is built.

Litwin (1995) explains improving the accuracy of a survey is explained and the treatise dwells on how to assess and interpret the quality of the survey data thoroughly by examining the instrument used. He explains how to code and pilot-test the new and established surveys. In addition, he covers issues such as: how to measure reliability (including test-retest, alternate form, and internal consistency, inter-observer and intra-observer reliability); how to measure validity (including content, criterion and construct validity); how to address cross-cultural issues in survey research; and how to scale and score a survey.

Lam (1995) reports on the results of a survey of 220 frontline supervisors in Hong Kong using the job descriptive index (JDI) to investigate the perceived impact of total quality management (TQM) programmes on job satisfaction. The results indicate that the respondents were much less satisfied with the work dimension than with factors such as supervision and co-working. TQM programmes are found to have had no impact on pay and promotion. The respondents perceived that the TQM programmes had led to a variety of changes which made their jobs more demanding, requiring greater individual skill and accuracy, but did not make their jobs more interesting and important. The significance of these findings is discussed in the context of the need to provide employee satisfaction in total quality management.

Mann and Kehoe (1995) have pointed out that quality management is always tailored to the specific needs of any organization. Their paper discusses the findings of a research programme that investigated the organisational factors which are important to be considered while implementing TQM. Questionnaires and structured interviews, involving the participation of over 200 companies, were used as the main tools for the investigation. Seven prime factors are identified as influencing the implementation of TQM: process factors, type of employees, shared values, management style, organizational structure, number of employees and industrial relations. They recommend that organizations should specially consider these factors, while developing the quality management approaches and the research paper provides an insight into the factors, which are likely to affect the implementation of TQM.

Naumann and Giel (1995) stress that customer-driven quality demands that organizations focus on core competencies, where they have distinct competence in creating a customer value. A customer-driven company is significantly different from one which is market-driven. While the latter is poised towards market growth and target markets, the former identifies the customer to be the judge of the value-added processes of the company. The ultimate index of the performance of a customer-driven company is customer satisfaction and eventually customer delight.

Harrington (1996) explains out that many of the improvement tools are chosen without really understanding their impact on the performance of the organisation. Some of these do challenge the basic principles on which quality management systems are built. Presentation of the data from the International Quality Study performed over a three-year period by Ernst and Young and the American Quality Foundation, with over two million pieces of information in its data base, is the largest benchmark resource in the world today.

This highlights the similarities and differences between the practices followed in USA. It also defines the best practices undertaken, based on the statistical analysis of the business results achieved internationally.

Thiagarajan and Zairi (1997), in the third part of a three-part series which represents a comprehensive review of the literature, discuss the critical factors of TQM in the key areas often stressed in the implementation of case studies, and supported by quality gurus and writers. Such factors are considered as being conducive to the success of TQM implementation. These cover issues related to the implementation aspects such as the role of culture, reasons for failures of quality management programmes, gestation period, etc.

Hesan and Samuel (1997) highlight the importance of QMS for small and medium enterprises (SMEs) to improve their current business practices as well as quality of products and services, to ensure long-term success. However, there are several barriers to the effective implementation of QMS in such organizations, like the apparent lack of business experience and knowledge, and limitation of financial as well as human resources.

Mohanty (1997) proposes a research agenda in the field of QMS, which according to him, is to arrive at an integration of the structure and process, theory of empiricism, top-down and bottom-up management approaches and technologies. This research is primarily an end initiative in that direction to facilitate organisational learning and embedded knowledge of QMS.

Pilar et al. (2001) discuss about the managerial issues of ISO 9001: 2000 certification and its empirical evidence.

Raghunathan et al. (1997) compare the quality management practices in three different countries namely, USA, India and China. In this research work, various constructs representing quality management practices and quality

results have been conceptualized. A survey instrument has been developed, pre-tested and the final version of the questionnaire incorporates the results of pre- testing.

Gilbert and Sia, 2001, in the article, “ISO 9000: The answer for total quality management implementation? The Malaysian case” has elaborated the findings from a survey conducted on a sample of 100 Malaysian companies that had gained ISO 9001: 2000 certification. The survey mainly focused on whether achieving this quality status has been perceived as having contributed to the implementation of total quality management in these companies. Besides this, the perceived benefits of seeking certification, both for the different industrial sectors and for individual companies, were identified.

Thawatchai and Subba Rao (2007) have provided a deeper understanding of current quality measures and recommendations for appropriate TQM practices. Their article adopts a meta-analysis approach to study issues concerning reliability of TQM measures and find the consensus on the relationship between TQM practices and organizational performance, across studies.

Forza and Filippini (1998) discuss a causal model which was formulated to investigate the relationship of total quality management (TQM) practices with two aspects of quality performance, conformance to quality and Customer Satisfaction. The model aims to enhance the formulation of TQM theory and to indirectly establish that the tool can be used to promote quality awareness in the industrial system. Application of the model on the data obtained on a stratified random sample of manufacturing plants revealed the presence of two different paths of direct influences that could result in Customer Satisfaction and quality maintenance.

Easton and Jarrel (1998) in their article, examine the impact of total quality management on the performance of 108 firms that began TQM implementation between 1981 and 1991. The impact of TQM is measured by comparing each firm's performance to a controlled benchmark designed to capture what the performance would have been there without TQM. The findings indicate that performance measured through accounting variables and stock returns is better for the firms adopting TQM. The improvement is consistently stronger for firms with more advanced TQM systems.

Angel et al. (1998) have attempted to trace the origins of the term TQM and clarify the different definitions employed by academicians and practitioners. Feigenbaum and Ishikawa are perhaps the greatest contributors to the development of this term. Other well-known quality management researchers such as Crosby, Deming and Juran have shaped the dimensions, practices and mechanisms which underlie the concept, but it is noted that none of these three actually used the term TQM. It started to be used in the mid 1980s and only became a recognised part of the quality-related language in the late 1980s. They also analysed the key dimensions of TQM and traced their origins.

Mohanty and Lakhe (1998) attempt to identify the critical factors for QMS implementation, through a survey-based research carried out in Indian industries. Meanings and operational measures of such critical factors are articulated and developed by involving the industry managers as the appropriate subjects. Internal consistency and reliability tests are applied to these measures. A model has been evolved which could facilitate the articulation of global perspectives, understand business imperatives, and undertake strategic initiatives to implement quality programmes across the different industrial

sectors. Besides a framework for subsequent research and for evaluation of QMS programmes by the industrial practitioners has been proposed.

Zhou et al. (1999) assert that quality is a fundamental assurance towards enterprises' survival and growth. The design and development of a quality system in the environment of a continuous information and monitoring system (CIMS) is a very important task during the process of its implementation. This paper addresses the task of development of a quality system and its implementation methodology in the environment of CIMS in China. The quality system is one of the subsystems in CIMS, which generally includes a management information subsystem (MIS), an engineering information subsystem (EIS), a production information subsystem (PIS), a quality information subsystem (QIS), and database and network support subsystems (DNSS). This paper introduces a model of the quality system and its detailed functions as the first step and later expounds the methodology and strategy of implementing it in a CIMS factory in China, and lastly examines the commonly encountered problems in its implementation, and suggests ways to resolve these.

Janak (1999) gives an account of quality movement in India, during the 35 years after her becoming independent. The slow rate of economic growth and its high cost during this period are elaborated. Periods 83-94 and 94 till date exemplify the introduction of quality movements such as TQM. This has helped to develop at least 5% of the Indian organizations to come on par with those of the developed nations. Essentially, processes like improvement of vendor quality, process standardization, training, JIT (Just in Time) have been adopted to upgrade the quality of products, process capability, involvement of people and flexibility.

Shari and Elaine (1999) explain the role of critical success factors (CSFs) in the implementation of quality of small and medium industries. Defining and measuring these factors have been a challenge as per Zairi (1996). The study of CSFs has been further pursued by Saraph et al. (1989), Ahire et al. (1996), Porter and Parker (1993) etc. The article gives a birds-eye view of the various researchers including the above-mentioned ones, on CSFs. A number of methods including the one used in Malcolm Baldrige Award criterion are touched upon. The focus areas discussed present systematically the factors with in TQM and thereafter the factors critical to implementation. The paper concentrates on the studies of large companies while very few are related to small businesses. Ten critical factors have been proposed and these too are more suitable for the industries in the large and medium sector.

Mike et al. (1999) speak about Benchmarking (BM) as a tool of TQM, which has attracted the attention of practitioners of quality. Typically, BM originated in the USA, while the European companies have been lagging behind in adopting this technique. This went on till the institution of the quality award in 1992 and UK quality award in 1994. Business process reengineering, otherwise called as BPR, was conceived and developed since 1980 as a way of radically changing the process adopted by the organisations. The paper also highlights the reason for replacing BM by BPR. A case study on Boots Company (BTC), Nottingham, has been referred to in this. In conclusion, it is mentioned that Top Management Commitment is better present in BPR companies than in those practising BM.

Zhiwei and Larry (1999) make a clear and distinct comparison of the two quality management programmes, (TQM) and ISO 9001:2000 in their research paper. The successes and failures of quality implementation as referred to in the literature are elaborated in this. While discussing the failures and

successes of TQM, it has been reported that lack of Top Management Commitment has been the major barrier to success. However, it gives adequate importance to SPC, employee participation, leadership, training, and team work as well. But individualism, overdoing measurement of Customer Satisfaction, over confidence due to winning of awards, linear thinking, etc., have led to its failure too. The experiences in Ericson Inc, Champion International, etc., have been quoted. Mention is also made of the fact that ISO 9001:2000 registration does not guarantee the quality of the product; on the other hand, it does only attest the quality practices followed in the company. The advantages of ISO 9001:2000 implementation mentioned here are competitive advantage, higher perceived quality, increased market share, greater quality awareness achieved by the employees, etc. By way of conclusion, it is said that the influence of TQM is getting reduced, and popularity of ISO 9001:2000 is becoming more evident and strong, as seen from the literature.

Shannon et al. (1999) have undertaken a systematic research study of the important question why firms seek ISO 9001:2000-certification: regulatory compliance, or competitive advantage? The hypothesis tested here is that firms obtain ISO 9001:2000 certification in order to comply with the Government and customer demands. The proponents of ISO 9001:2000 certification and its critics have naturally opposing views. The former claim that the foundation of ISO 9001:2000 is the prelude to any TQM effort. The critics conclude that ISO 9001:2000 is only a bureaucratic waste and does not give any added advantage to TQM. The findings of the study indicate that companies obtain ISO 9001:2000 certification as a credible public signal of effective quality management practices. There is no evidence of regulatory requirements being imposed on Government suppliers. At the end, it is stressed that customer compliance and regulatory compliance are inadequate justifications for

wide-spread adoption of ISO 9001:2000 9000 in North American manufacturing industries.

Guangming Cao (2000) concludes that while total quality management systems (TQM) have been widely applied in the management for change, and are likely to spill over to the next century, failure rates above 75 per cent at times cause concern. Their study has reviewed QMS and TQM as logical approaches to change management. Four interrelated classifications of organizational changes are presented: change as a structure, a process, a source of value or power distribution. Of these, it is contended, TQM adequately addresses process change alone, with the incidences of failure closely correlated to the application of process-based techniques in the change contexts characterised by structure, values or power. This study also suggests that, for successful application of TQM, either an approach is required which adequately addresses all types of change contexts (also called "systemic" approach), or its application needs to be restricted to those contexts where processes dominate.

Selladurai (2000), clarifies that QMS interventions or activities must be guided by four change principles, namely, work processes, variability, analysis, and continuous improvement. Product design and production processes must be improved; variance must be controlled to ensure high quality; data must be systematically collated and analysed with the help of a problem solving cycle; and commitment must be made to implement continuous learning by the employees about their work.

Larsen and Haversjo (2000) have indicated that the revision of ISO 9001:2000 Standard for changes was completed in February 1999. The ISO 9001:2000 standard has been revised from a technical practical tool to a management tool. Four problems with ISO 9001:2000 standard development are discussed, such as: some of the demands on the management; the

comparative strength of the ISO 9001:2000 standard concept; the changed role of the certifying bodies, and the implied paradigm of the management. The consequence of these problems may be that the standard turns into a legitimacy seeking management concept alongside other popular “three-letter acronyms” and thereby adds to the growing amount of hypocrisy in management.

Atul’s empirical study (2000) is the first attempt to find out the differences between organizations in India which are certified by ISO 9001:2000 and which are not certified. The areas of study included technology management, causes for poor quality, participation in the quality improvement programmes, and quality control techniques used. The results of this study indicate that there existed a significant difference between ISO 9001:2000-certified organisations and those which were not certified for quality, under all the four categories, specifically in training, applying quality in strategic planning, product design and team building, which have been statistically proved.

Mohsen (2001) presents an analogy between Total Quality Management and Systems Engineering (SE), and demonstrates that TQM has the characteristics of a system such as elements, components, function, hierarchy, and environment. Further, the author shows that approaches of SE such as, clear definition of requirements, team approach, top-down and bottom-up approach, and life cycle orientation are inherent in TQM. The utility of the analogy between these two philosophies was demonstrated by contrasting attempts that succeeded and those that failed in implementing TQM. The contrast suggests that adhering to the concepts and approaches of SE could enhance the implementation of TQM.

Naceur (2001) states that increased global competition, wherein high quality and low cost are at a premium, leads to increased interest in continuous improvement. The success of continuous improvement initiatives is dependent on many factors that include leadership, structure, and shared organisational

values. This paper identifies two sets of values that underlie continuous improvement. The first set comprises driving values; the second set, the enabling values. The paper also presents a few measures for infusing these values, for the benefit of the organizations.

Torre et.al.(2001) comment that in this changing business environment, there are many developing organisations that go in for ISO 9001:2000 certification, in order to continue to be competitive. This certification process initiates certain changes in the organisation which affect the diverse functional areas. The article presents the results obtained from a study of a set of certified companies in a specific geographical area, and makes an attempt is made to test diverse hypotheses related to the influence of this process of certification with respect to human resources and post-certification processes. The study was able to corroborate the existence of quality in more than 50 per cent of the certified companies under consideration.

Amar and Zain (2002) have brought out the barriers faced by Indonesian manufacturing organizations in the implementation of QMS. Out of a total sample size of 364 selected organizations identified for a multi response survey, 78 organizations responded. The analysis identifies eleven pertinent factors acting as barriers, which the local organizations come across mostly. These are issues related to the human resource management, attitude towards quality, organizational culture, interdepartmental relations, raw materials, machines and equipment, information, training etc.

Jha and Joshi (2002), have studied the importance of quality management philosophy and business excellence models in strategy implementation for adopting ERP within the organisations. There is very little research done where-in the concept of QMS as a philosophy or a business excellence strategy is integrated into the concept of ERP implementation. They have attempted to integrate this

concept within a broader perspective of QMS, as a part of corporate strategy in an organization. They also have built upon the foundation of the major researches done in the area of QMS and BE (Business Excellence). The concerns and issues of both the elements are discussed in detail. A short case study on the first company in India to get the coveted Deming Prize (Sundaram Clayton) based on the integrated Japanese model for business, is done in this paper. The authors also attempt to project a holistic perspective of ERP implementation as a part of QMS or business excellence strategy implementation.

Yang et al. (2003) discuss some aspects of quality management in semiconductor industry in Taiwan. This industry is in the limelight of the manufacturing firms across the globe. Quality management is strategically and tactically important for gaining competitive advantage, in this case. Since this industry is one of the major suppliers of semiconductor products, to the nooks and corners of the world, its quality management practices have a global acceptance. This research was conducted with the help of a proven measuring instrument for quality management practices, which contained eight critical factors and 63 related parameters. Data were analyzed with respect to their reliability, mean rank, consistency, and correlation. The results of analysis revealed the insights into managers' perception of quality management practices in the semiconductor industries.

Wali et al. (2003) have made an attempt to synthesize various critical factors given by the authors, in the form of a table. Although the factors and the approach may vary from author to author, eventually they lead to the same goal: continuous improvement. The authors mention that some of the critical factors discussed by researchers are, top management leadership for quality, supply chain management, process management, employee training, and employee involvement. QMS implementation involves a blend of hard and soft quality

factors. Soft quality factors are intangible and difficult to measure, and are primarily related to the leadership and employee involvement. Hard quality factors, on the other hand, refer to the systems, tools and techniques, such as those which influence the internal efficiency (e.g. quality management systems, cost of quality and statistical process control) and external effectiveness (e.g. benchmarking and Customer Satisfaction surveys).

Sila and Ebrahimpouri (2003) have analysed and compared 76 empirically validated quality factors and their impact on various performance measures across the countries. The findings show that Top Management Commitment and leadership, customer focus, information and analysis, training, supplier management, strategic planning, employee involvement, human resource management, process management, teamwork, product design and service design, process control, benchmarking, continuous improvement, employee empowerment, quality assurance, social responsibility, and employee satisfaction were the most commonly extracted factors among the 76 empirically related ones.

Magd and Curry (2003) observe that the ISO 9001:2000 series of standards have formalized the systems for evaluating the capability of the organisations to consistently design, produce and deliver quality products and services. QMS has been seen as a relatively newly formed concept and a way for the organisations to improve the quality of their products and services. But it could very well be the key to survival and the tool for achieving competitive advantage in today's turbulent business environment. However, there were mixed views in the literature as to whether ISO 9001:2000 and TQM complement or contradict each other. The primary objective of the authors was to address the competing views of both the concepts, in an attempt to show that

both concepts complement each other and that ISO 9001:2000 should be used in association with TQM to secure organizational success.

Sadiq and Teo (2003) examine and compare the quality management practices and organisational performances of small to medium enterprises (SMEs) with and without ISO 9001:2000 certification in Malaysia. A quality measurement framework has been developed based on the critical success factors of the QMS programme. Empirical research was carried out to identify the differences, in the QMS implementation and organizational performances of SMEs in both categories of quality compliance. The quality measurement framework provides a benchmark of QMS practices for SMEs, which are in the early stage of implementation of the quality programme and this is proposed as a quality checklist for these to improve and focus on the specific areas of their respective quality programme. The findings of the research indicate that there are significant differences in performance between certified and non-certified firms, supporting the hypothesis that ISO 9001:2000 certification contributes to a higher organisational performance.

Palo and Padhi (2003), hold that Quality Management System (QMS) is a never-ending journey of the improvement of work processes. It operates according to the premise that organizations cannot rest comfortably without continuously improving whatever is being done. There has to be a culture of continuous improvement and everyone in the organization must strive for it. This could be accomplished only by continuous training. Their present study seeks to examine the role of training as well as the need for measuring its effectiveness for successful implementation of QMS. The authors have found that training creates awareness, enhances employees' commitment to quality policy and strategy, facilitates teamwork, upgrades performance standards, and bolsters the skills and abilities of the employees. However, any organisation

needs to focus more on improving communication competencies as well as multiple skill development, and imparting customer value training. Organising training in the quality management systems needs more budgetary allocation, commitment and support of, and enthusiasm from, the top management.

Ayooop et al. (2003), are of the opinion that in the context of QMS, it is essential for the organizations to identify a few key critical success factors, which should be given special attention for ensuring successful implementation of this programme. The concept of Critical Success Factors (CSFs) and their use in supporting planning efforts, originated from the approach associated with the development and implementation of management information systems. The authors present a review of the literature on CSFs, supported by various philosophies of QMS. Such factors are considered as conducive to the success of the quality implementation. Based on an exploratory study of Indian organizations engaged in manufacturing and services, CSFs have been identified.

Salaheldin's study (2003) aims to explore the critical resisting and driving forces that detract or promote the implementation of quality management strategy in Egypt, in an attempt to find out whether QMS can be implemented effectively in this developing country. The field of survey of this empirical study is the Egyptian ex-public manufacturing organisations. A mail questionnaire was used to collect the requisite data. Force field analysis was used for identifying the salient factors affecting QMS implementation in Egypt. Surprisingly, the findings indicated that forces that promote or detract quality implementation seen in one developing country could very well be applicable to a less developed country also. Some driving forces that promoted implementation of quality strategy and a few roadblocks that detracted the implementation of QMS in these organizations are located, during this study. Managerial implications for the successful

implementation of quality are provided, and finally avenues for further research are recommended.

The empirical study conducted by John and Philip (2003), states that consumers evaluate product quality with information signals such as brand name which gives an advantage to the established organisations over others, even while introducing a new product. Another signal is 'country of origin'; as rich nations focus more seriously on maintaining better quality, there is a tendency for consumers to associate quality with the country's per capita income. Thus new organizations from developing countries face severe problems in the export markets. Standardization at an international level offers a potential solution to their problems. However, an analysis of the functioning of ISO 9001:2000 indicates that it is difficult to eliminate the informational asymmetry.

Mahadevappa and Kotreshwar (2004), view that meeting the requisite quality is one of the challenges Indian companies have been facing during the post-liberalization era. The ISO 9001:2000 certification undergone by companies reflects the strategy to meet this challenge. The authors' study encompasses the quality management practices in sixteen ISO 9001:2000-certified companies in India. They evaluate the level of implementation of eight critical factors of quality management, and their impact on quality. The authors conclude that ISO 9001:2000 certification has helped the companies in improving their product quality only marginally. They further opine that ISO 9001:2000-certified organizations need further improvement, and that ISO 9001:2000 quality management systems are to be integrated with TQM for continuous improvement of quality.

Sandeep et al. (2004) have observed that different quality management environments may be suggested to an organization for improving the quality of

their products, bettering Customer Satisfaction, enhancing competitiveness and increasing profitability by the specialists in quality management practices. The factors responsible for a good quality environment have been identified by the authors. All these factors interact with each other in varying proportions. An attempt has been made to develop a mathematical model of the QMS environment from these interacting factors, using a graph theoretic approach.

Jha (2005) in his doctoral thesis demonstrates the case study methodology of research for selected Indian companies, which have been applying the concept of QMS, as a part of their corporate strategy through various popular business excellence models available for QMS strategy implementation. ERP implementation becomes an inherent part of management, like the leadership process, strategic planning or policy framework and process management for any business excellence model, for gaining competitive advantage.

Seth and Tripathi (2005) have studied the strategic implications of QMS and TPM in an Indian manufacturing set-up, and detailed literature reviews have been mentioned to highlight the gaps. The authors identify two sets of factors which are critical for the effectiveness of QMS and TPM: universally significant factors like leadership, process management and strategic planning; and approach-specific factors like equipment management and focus on Customer Satisfaction. Their study also highlights the complexities involved in implementing QMS and TPM together. This study is equally important in a global context also, as companies across the globe are striving to achieve synergy of both. The preparedness and the status of the Indian manufacturing industry for the implementation of these have become critical, as India is becoming a major sourcing base for the whole world. Such research studies are far and few, and there have not been many investigations on the quality

management practices followed in the developing countries. Such studies are equally important in a global context too.

Barbiroli (2005) asserts that enterprises are used to manage quality together with productivity but neglecting environmental management, on the other hand. This involves higher costs and lower benefits than if they were managed jointly. Therefore, efforts must be made to link all of the main aspects of global performance and efficiency. In recent years, several methodologies have been developed and implemented to consider and sort out all the aspects of performance (concurrent engineering, quality function deployment, rapid prototyping, lean production, design for assembly and disassembly, and total quality management) and seek to propose a technique to attain such a result, within the ambit of continuous improvement.

The analysis of the study is based on the correlation between 12 aspects of performance and efficiency in the production processes, general specifications of the project, detailed specifications for the subsystems, and production modalities. The major finding is that this can be done by constructing specific matrices, by utilising both technical and economic data, which permit to identify the modifications to be introduced in the processes and products so as to improve the various aspects of the performance. The study emphasises the way to follow the adoption of the methodologies capable of integrating all the aspects, to achieve increased efficiency.

Harman (2006) observes that quality management system is the process of embedding quality awareness, at every step of production or service, while targeting the end customer. We represent it, based on the five cardinal principles of top management conviction, customer-centric advancement of the processes, benchmarking, relentless improvement and strengthening of the employee base. Locked in the backdrop of increasing awareness for

benefit realization through the synergy between Information Systems (IS) and QMS, this paper reviews the readiness of an information system in India for adopting QMS. He concludes that Indian IS managers have a fair understanding of QMS and this shows an upward trend. Top management support is the single most important factor needed for implementation of QMS for IS, and better quality of services are presumed to be the most important benefit realised by the organisation.

Mukherjee (2006) presents a comprehensive view of the concepts, principles and practices of the quality management system from the basics through advanced tools and techniques for practical implementation. It is well known that the 'Total Organization Involvement' in understanding and implementing QMS, along with the integrated business strategy, provided the Japanese organisations poised as a strong platform for the meteoric rise to a world class level of leadership in every sphere of their operations. Hence the success of QMS depends a lot on the strong foundation and infrastructure of an organisation and helps to create a world-class management system for performance excellence and global leadership. The author has provided a wide cover for all areas related to QMS and integrates all its processes, tools and techniques under one umbrella to help the business to grow and excel.

Olszak and Ziembra (2006) have stated that, today the effort of the top management in improving business standards and Customer Satisfaction, through executive decision making, is mandatory to reach out to higher levels of excellence.

Rajbir et al .(2006) comment that in the post-liberalisation era of the Indian economy, many Indian organisations adopted quality programmes such as ISO 9001:2000 This was done to match the international standards of processes, product quality and standardisation. A majority of these

organisations eventually discontinued these programmes. The authors conducted a study of the small and medium enterprises (SMEs) of Punjab to ascertain the problems faced in the process of implementation of ISO 9001:2000. Older organisations faced the problems of unwilling middle managers and perceived the complexities of the process of administering QMS, more acutely than in newer organisations. The problem of sustaining employee interest and involvement was more pronounced in the smaller ones than in the medium type organisations. In older SMEs, the problem of centralised decision making did not come up as a significant impediment to the successful implementation of ISO 9001:2000. The authors conclude that organizations which did give benefits to its employees for participating in such quality-related programmes had higher levels of sustained employee participation.

Singh and Singla (2006) state that quality management has assumed great importance in today's highly competitive manufacturing industry. QMS has been widely implemented throughout the world. Many firms have arrived at the conclusion that effective QMS implementation can improve their competitive abilities and provide strategic advantages in the marketplace. There are many approaches used for the implementation of QMS in industries. These include division of tasks into subtasks, addressing the human and social aspects of implementation and education of the top management. It is, however, observed that there is a great degree of diversity within the organisations with regard to products, processes; types of resources used, education level and background of employees, and so on. Therefore, it is recommended that a flexible approach for implementation be used which takes into account the factors and forces prevalent in the industry. The paper presents a study using a flexible systems methodology for the implementation of QMS in the

manufacturing industry. The framework involved the management of industrial 'situation' by the 'actor' (industrial unit) through a management 'process' in a flexible manner; actor, situation and the process are the three inseparable components of flexibility.

Lakhal et al. (2006) aim to explore the relationship between quality management practices and their impact on the performance. First, critical quality management practices are identified and classified into three main categories: management, infrastructure, and core practices. Thereafter, a model linking these practices and performance is proposed and empirically tested. The empirical data were obtained from a survey of 133 Tunisian companies from the plastic transforming sector.

The findings reveal a positive relationship between quality management practices and organizational performance. Moreover, these show a significant connection between management and infrastructure practices. The results also illustrate a direct effect of infrastructure practices on the operational performance and core practices on product quality respectively.

Singh et al. (2007) comment that in the globalised scenario, there has been a tough competition between the manufacturing as well as the service sectors for achieving better quality in their outputs. However, the firms have to struggle with growing trade deficits and outsourced operations, as stronger competitors have emerged in the market. They deploy superior manufacturing practices and have taken up continuous process improvement, as a matter of routine. The small and medium enterprises are also being stressed by their customers to adopt quality management systems. The present work is an exploratory study of the impact of ISO 9001:2000 certification on output parameters. The parameters incorporated for the study are manpower, assets utilization, inventory management, quality aspects, cost aspects and purchasing

procedure. A comprehensive questionnaire was framed; different firms were selected in and around Jalandhar in India and data were collected through personal interviews. On the basis of the literature review and preliminary survey of the industry, hypotheses were formulated, data were processed and analysed. Hypotheses were validated using correlation analysis.

Sachdeva et al .(2007) , have stated that in today's competitive and quality-conscious market, acquisition of ISO 9001:2000 certification has become a critical factor for the Indian companies for their existence. The purpose of this paper is to check whether the organisations are really benefitted by getting the certification and to what extent the various performances have got improved. Four major areas of measurement of organisational performance: quality and its cost, external quality, schedule of operations and purchasing were selected for studying the level of impact. It was observed that organizations have been able to improve their performance in all the four areas of study with the degree of improvement varying from marginal to significant.

James (2007) opines that ISO 9001:2000 certification yields visible and concrete benefits to the organizations in the form of sustainable product quality, enhanced market image, increased Customer Satisfaction and long-term profitability. However, the derivative impact of ISO 9001:2000 on the human side of the organisation, especially its impact on the internal human environment, has been only scantily researched. The purpose of this study is to explore how the process of ISO 9001:2000 implementation transforms the components of organizational climate, particularly the climate motives existing in an organisation. The methodology of the study states that ISO 9001:2000 system was the independent variable that could induce changes in the organizational climate which is the dependent variable. The climate was measured before and after the implementation of ISO 9001:2000, using

Pareek's MAO-C instrument. Based on the scores obtained for the constituent climate motives, the patterns of organizational climate that prevailed in an organisation prior to and after ISO 9001:2000 implementation were studied. The results of the study reveal that as a result of ISO 9001:2000 implementation, the dysfunctional organizational climate motives such as control, dependency, and affiliation undergo a u-turn transformation, giving way to the functional and conducive climate motives such as achievement, expert influence, and extension.

The study endeavours to throw light on the favorable impact that ISO 9001:2000 may have on the climate of the organisations. The findings tend to prognosticate that when implemented well, the ISO 9001:2000 system could function not only as a quality enhancement instrument, but also as a useful tool for strategic change management that could truly hold the potential for transforming both the character and the performance of the organisations.

Apte et al .(2007) are of the view that, although customer convenience should be rightly considered as a central element in field services, the customer experience suggests that service enterprises rarely take the customer's preferred time into account in making operational and scheduling decisions. This paper discusses the results of our exploratory research into two interrelated topics: the explicit inclusion of customer time in non-emergency field service delivery decisions and the analysis of the trade-off between the customer's convenience and the field service provider's cost. Based on prior research in service quality, they identified and illustrated two time-based performance metrics that are particularly appropriate for assessing service quality in such services: quality of performance and quality of conformance. To determine the vehicle routes, they developed a hybrid heuristic derived from the existing and proven heuristic methods. A numerical example, closely patterned after real-life data is

generated and used within a computational experiment to investigate alternate policies for promise time windows. Their experiments demonstrated that over a reasonable range of customer cost parameters, the policy of shorter promise time windows reduced the combined total cost incurred by the provider and the customers. This policy should be considered a preferred policy by the field service provider. Managerial implications of this result are discussed.

George and Sampath (2007) used a real options approach to analyse investments in the process improvement of a simple, stochastic model of a firm making decisions of this type. Their analysis offers several interesting insights into the investments in process improvement. First of all, an early investment in the process improvement results in valuable knowledge, which helps to increase the value of the option to invest in process improvement in future. This motivates a firm to invest in process improvements as early as possible. Secondly, it can be optimal for a firm to stop investing when such investments do not create enough value in the later stages of the investment horizon. Finally, although one would expect the state of a firm's process relative to that of other firms to impact a firm's decision to invest in process improvement, this study finds that the impetus is conditional and identifiable. Eventually, in such an environment, the delay of the investment in process improvement incurs an opportunity cost for a firm, and it is shown that the traditional net present value rule must incorporate this opportunity cost, and the knowledge- induced change in future option values should lead to a correct investment decision.

Mehra and Ranganathan (2008), examined the role of quality management system (QMS) in enhancing Customer Satisfaction. The authors used Meta analysis; existing research studies on quality management and Customer Satisfaction were quantified, summarized, and tested for moderators to verify the impact of QMS. The authors have found that implementation of

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QMS substantially increased Customer Satisfaction across various industrial and cultural backgrounds. This research broadens the scope of QMS in all kinds of professional enterprises,

Bureau of Indian Standards, 2000, Quality Management System-Requirements, gives a total account of the mandatory requirements of ISO 9001:2000 and the processes to be followed, for obtaining the certification.

Bureau of Indian Standards, 2000, Quality Management System-Guidelines for performance Improvements, ISO 9004: 2000, is a consistent pair of standard for ISO 9001:2000 and uses a broader perspective of quality management to give guidance for performance improvement.

The elaborate review of studies reveals the significance of ISO 9001:2000 implementation and practices in an organization- wide scenario, and it has been found that the performance of the organisations does not depend on the quality certification alone. This is identified as one of the research findings in the current study as a result of the analysis of quality management practices existing in ISO 9001:2000-certified organizations and in those which are not qualified by ISO 9001:2000 standards, in the selected organizations in Kerala.

In addition to these, a good number of books and journals were also referred for obtaining more information, on similar works carried out by learned researchers. These are given under 'References' in the later part of the thesis.

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**SIGNIFICANCE OF QUALITY MANAGEMENT  
- THEORETICAL PERSPECTIVES**

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### **3.1. Origin of the Quality Management Concept**

The Quality Management System is a management approach that originated in the 1950's and has steadily become popular since the early 1980's. Quality is the conglomeration of the culture, attitude and values of an organisation that strives to provide the customers with the products and services that satisfy their present and future needs. In order to have this in position, all the aspects of the operations of the organisation and its processes are set right at the first time itself and defects controlled to the maximum possible extent. Quality management is a methodology in which management and employees work hand in hand for the continuous improvement in the production of goods and services. It is a judicious blend of quality tools and management tools aimed at increasing business opportunities and bringing down losses due to wasteful practices. Some of the organisations which have implemented quality management practices successfully in the very early stages include Ford Motor Company, Phillips Semiconductor, SGL Carbon, Motorola and Toyota Motor Company, IS/ISO 9001:2000 describes the quality management practices followed for meeting the requirements of the quality management systems.

### **3.2. The framework of ISO 9001:2000**

It is a strategy that is based on Continual Improvement of all the processes, empowerment and involvement of people, progressive learning,

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thereby creating the transformation towards an entity that will provide world-class products and services. This management system is the outcome of a dedicated effort seeking to evaluate and improve the quality of goods and services. Much can be achieved by practising innovation and fostering creativity, but competitive advantage is sometimes affected by continuous process improvement. Quality management is an established field of study where academicians, consultants, engineers and quality practitioners have contributed their mite towards its advancement. Deming (1986) provides an operational definition for quality management system, which gives a motivational outlook to the concept. Sink states that quality management system can be successful only if the operational definition is translated into strategies by the leadership of the organization, which in turn, are crystallised into actions and communicated to all the people with conviction and clarity.

However, it may also be viewed functionally as an integration of two basic functions, i.e. total quality control and total quality management. Total quality control is a long-term success strategy. Customer Satisfaction, employee satisfaction, product quality assurance in all its stages, and Continual Improvement and innovation are the main phases of total quality control (Aravati and Mokhtar 2000). Quality management is a way of planning, organising and directing that will facilitate and integrate the capabilities of all employees for Continual Improvement of anything and everything in an organisation to attain excellence (Anthony et al.2000).Thus, quality management system in an organisation brings all the people together to ensure and improve the quality of products and processes, the work environment and the work culture.

It is also a management philosophy that seeks to integrate all the functions such as marketing, finance, design, engineering, production and customer service, so as to align the customer needs with the objectives of the

organisation. An organization is viewed through the management of a set of processes, which states that it must strive to improve these processes continuously by incorporating the knowledge and experience and expertise of the workers. The simple objective of a quality management system is "Do the right things, first time and every time". Even though it was originally applied to manufacturing operations only in the yesteryears, it is now getting recognised as a generic management tool and is applicable to public service and private sector organizations as well. There are a number of evolutionary standards, with different sectors creating their own versions from the common ancestor. ISO 9001:2000 is the foundation for all the functional and managerial requirements, which encompasses many features such as:

### **3.2.1 Commitment by the Top Management**

Top Management Commitment will be very clearly visible through the attention paid by them to the issues which arise sporadically. The belongingness of the employees, their loyalty to the task assigned as well as to the organization, will depend very much on the commitment displayed by the senior management. The Top Management should be committed to overcome any barriers to the implementation of the objectives of the quality management system (Longo and Cox 2000).

### **3.2.2 Meeting Customer requirements**

In a competitive and dynamic environment, the customer requirements keep changing and in this volatile situation, the management should be agile to conceive and execute decisions so that the future needs of the customers are also taken in to account (IS/ ISO 9004: 2000, Hauscr et al .1994).

### **3.2.3 Reducing Cycle time**

The cycle time of a process or a product will eventually influence the efficiency of the system. Implementation of WBS (Work Breakdown Structure), restructuring of the processes after a meticulous analysis, and bringing in synergy to the whole team can bring down the cycle time (Hubert 2000).

### **3.2.4 Reducing Lead Time**

Introduction of modern methods like Just in time (JIT) and sophistication of the existing techniques, coupled with the reduction of waste, can bring down the lead time to a great extent, as it reduces the idle time. When the demand is high, compared to the supply, reducing lead time can improve the efficiency of the business operations.

### **3.2.5 Improvement teams**

One of the prerequisites of a Quality Management System is to resort to Continual Improvement. This could be achieved either in steps or at one shot. The improvement teams will be drawn in from various functions and they will have the mandate for implementing the improvement plans on a time-bound basis. These are also termed cross functioning teams (Feigenbaum 1985).

### **3.2.6 Reducing costs of products and services**

In order to reduce the costs, repairs and rejection have to be minimised, and this is possible if the processes are made efficient and effective and monitoring and measurements are done on a continuous mode.

### **3.2.7 Systems to facilitate improvement**

Team building, collaboration and technology upgradation could be the startingpoint for facilitating improvement. Knowledge management through brainstorming sessions, suggestion schemes, quality circles, etc. can accelerate the improvement (Juran 1993).

### **3.2.8 Employee Involvement and Empowerment**

An empowered employee will get involved in all the activities whole-heartedly and the involvement of all the employees across the organisation will bring in a good work culture, thereby improving productivity (Clause 6.2.2.2. IS/ISO 9004:2000).

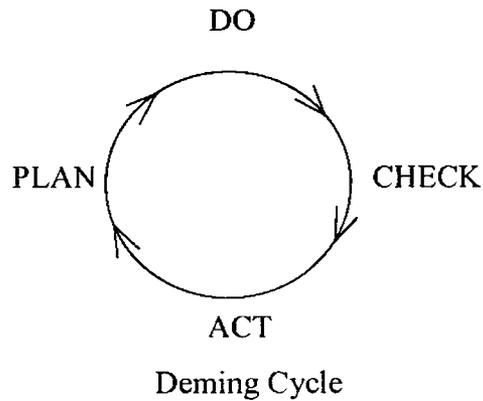
### **3.2.9 Achieving the quantified goals through benchmarking**

Achievement of mission and vision is easily accomplished by benchmarking the organisation to another one which is superior in performance in all respects. The goals should be quantified and should be achievable. Benchmarking can be done within the organization between different functions as well as with external agencies (Mike et al.1999).

## **3.3 Principles of ISO 9001:2000**

### **3.3.1 Management Commitment**

Management commitment is mandatory to ensure that the quality built in through the various processes is taken forward to all the levels and functions of the organization and maintained throughout. Providing adequate resources at the right time, to the right extent is an indication of the management commitment. Paying attention to the employees' issues, making the working environment friendly and comfortable, providing opportunities for growth, etc. will also be the responsibility of the top management. Edward Deming has devised a cycle, which has four steps; plan, do, check and act. This can be successfully used to implement all the quality plans. It is figuratively represented as follows:



**Fig.3.1** Total Quality Management

*Source: Suganthi et al. Total Quality Management., Prentice- Hall of India*

What is expected in the various steps are:

- a) Plan (drive, direct) ; organize all the activities well
- b) Do (deploy, support, participate) ; execute these in an efficient and effective way
- c) Check (review) ; verify whether the action taken is complete
- d) Act (recognise, communicate, revise) ; implement corrective actions

### **3.3.2 Employee Empowerment**

Training is a process wherein learning takes place and gives rise to a semi permanent change in behaviour. All progressive organisations provide adequate opportunities for training which eventually improves skill, knowledge and attitude. Suggestion scheme is considered a great motivator for improving creativity and instilling innovation. In Japan, an employee is obliged to make six suggestions per year as a matter of practice. An employee will perform well if the power to execute the tasks is assigned to him or her (Clause 6.2.2.2.IS/ISO 9004:2000).

### **3.3.2 Fact-based decision making**

In order to facilitate decision making effectively, there is need to deploy certain tools. This will help to avoid any bias while taking decisions, on account of familiarity or otherwise. The synergy of the team will also improve when decisions taken are fair. The tools used are:

- SPC (statistical process control)
- FMEA( failure modes and effects analysis)
- The 7 statistical tools
- TOPS (Team Oriented Problem Solving)

This factor has been elaborated by Saraph et al. (1989), Ahire et al. (1996) and Black & Porter (1996) in their models.

### **3.3.4 Continual Improvement**

This is a pre requisite of any quality movement. It comprises the following attributes:

- Systematic measurement (what cannot be measured cannot be controlled and hence the need for measurement),
- Overiewing and validation of improvements,
- Cross-functional process management (participation of members from all functions facilitates better business),
- Attain, maintain, and improve standards for the steady growth of an organisation

In organisations where quality standards are implemented, the improvement plans are finalized well in advance, in order to counter the challenges. Proper and timely reviews can reveal the actual status of improvement and suggest corrective action (Clause 8.5.4. IS/ISO 9004:2000).

### **3.3.5 Customer Focus**

Customer is the central point around which any business revolves, and so taking care of their present and future needs is mandatory for success.

This has constituents such as:

- Supplier partnership (suppliers become an important link in the business as their effective partnership and understanding contributes to its growth).
- Relationship with internal customers (healthy relations among the internal customers helps to bring down the level of defects).
- Strictness in quality practices (no waiver is given for variations and salvaging is done only in exceptional cases).
- Customer-driven standards (customers decide the quality as well as the standards).

In an ISO 9001:2000-certified organization, the supply chain management is very strong and proactive. The partnership among the internal customers and their active collaboration, along with a very good rapport with the external customers, is essential to maintain the quality standards (Clause 8.2.1. IS/ISO 9001:2000).

### **3.4 The concept of Continual Improvement in ISO 9001:2000**

ISO 9001:2000 insists on practising Continual Improvement in all facets of the activities right from high level strategic planning and decision-making to detailed execution of work elements in the field. It stems from the belief that mistakes can be avoided and defects can be reduced considerably, quality can be maintained easily. It will mean effecting the improvement everywhere as a

result of continuously improving the capabilities, people, processes, technology and utilisation of infrastructure.

Continual Improvement should get reflected not only in the quality of the results, but more so in the enhancement of the capabilities to produce better results in the ensuing future. The major thrust areas for capability improvement are demand generation, supply generation, technology, operations and people's capability. The general observations are that though mistakes are committed by people, most of them are caused due to faulty systems and processes. The root cause of such mistakes is to be identified and eliminated, and repetition of these can be prevented by resorting to proper corrective actions.

There are three major mechanisms of prevention:

1. Preventing the mistakes (defects) from occurring (mistake proofing or poka-yoke)
2. Detecting the mistakes early enough to prevent these getting passed on to the next stage of the value-added chain (inspection at source).
3. Stopping production whenever mistakes recur, until the process is corrected, to prevent occurrence of more defects (Stop in Time).

### **3.5 Implementation of ISO 9001:2000**

The first step in the implementation of ISO 9001:2000 is to assess the organisation's present health and its culture. A study of the organisation's history, its present needs and the existing quality of work-life of the employees should precede the discussions leading to the implementation of ISO 9001:2000. If the present reality does not jive with these important preconditions, implementation of ISO 9001:2000 should be kept in abeyance until the organisation reaches a state where success is visible in the near future. [Due to its importance, this may appear again in the latter part of the thesis. If

an organisation has a track record of effective responsiveness to the environment, and if it has been able to successfully change the way it operates when needed, it will be easier to implement ISO 9001:2000.

If an organisation has not been historically reactive and has no skill at improving its operating systems, there will be both employee skepticism and a shortage of skilled change-agents. If this condition prevails, a comprehensive programme of management and leadership development may be instituted. A management audit is a good assessment tool to identify present levels of organisational effectiveness and areas in which the change is needed. An organisation should be basically healthy, prior to administering ISO 9001:2000. If it has significant problems such as a very unstable funding base, weak administrative systems, lack of managerial skills, or poor employee morale, ISO 9001:2000 is not recommended at that point of time.

However, a certain level of stress is probably desirable to initiate QMS. People have to feel the need for a change. Kanter (1983) addresses this phenomenon by resorting to the concept of building blocks which is present in a predominant way to effect organizational change. These forces include departure from traditional thinking, a crisis or a galvanising event, strategic decisions, individual "prime movers," and action vehicles. Departures from traditional activities are those which usually occur at the lower levels of the organisation, and entrepreneurs move away from the normal ways of operating to solve a problem. A crisis, if it is not too disabling, can also help create a sense of urgency which can mobilise people to act. In the case of ISO 9001:2000, this may be a cut in the funding or a threat for this, or demands from the consumers or other stakeholders for improved quality of service. Whenever a crisis props up, an effective leader may intervene strategically by articulating a new vision of the future to take the organisation forward. A plan

to implement ISO 9001:2000 may be such a strategic decision. Such a leader may turn out to be a prime mover, who will take charge of championing the new idea and showing others how it will lead them where they want to go. Finally, action vehicles are needed and mechanisms or structures essential to enable the change should occur and become institutionalised.

### **3.6 Steps in managing the transition to ISO 9001:2000**

Beckhard and Pritchard (1992) have outlined the basic steps in managing a transition for a quality management system such as ISO 9001:2000 through identifying the tasks to be executed, creating the necessary infrastructure, developing the strategies for enhancing commitment, designing the mechanisms to communicate the change, and allocating the requisite resources.

Identification of tasks would include study of the present state of the art, assessing readiness for change through a force field analysis; creating a model of the desired state, announcing the change goals to the organization; and assigning responsibilities and resources. This final step would include appointing an external consultancy and assigning an individual within the organization to oversee the whole mechanism. This should be the responsibility of the top management. In fact, the activity of designing the transition management mechanisms is to be undertaken by the Top Management. Formation of an organization-wide steering committee to plan and review the progress will be the most appropriate action in this direction.

To communicate the change, mechanisms other than the routine ones need to be custom-built and developed. Special meetings of the employees designed as an input or a dialogue session, where executives also will be present, may be used to kick off the process. Quality management newsletters

may be an effective organ to keep the employees abreast of the activities and accomplishments of the organisation.

Management of the resources for the change effort is very important and a judicious combination of IRPs (internal resource persons) and external consultants can give promising results. Consultants may be chosen based on their prior relevant experience and their commitment to adopting the process to align with the organizational needs which could be unique. The consultants will be adding value through various processes including the training of employees. They will be receiving training in change management, which they can pass on to others later. The entire employees should be actively involved in ISO 9001:2000 implementation.

It may be noted in this context that implementation would be a complex, interactive, and long-drawnout process. The leaders will have to maintain their commitment, keep the processes transparent, provide the requisite support, and hold the personnel accountable for the results. There should be total involvement of all the interested parties, which will include stakeholders, shareholders, employees, banks, public, etc.

### **3.7 The elements of Quality Management System**

Quality Management System is a management approach that originated in the 50's and became more popular and acceptable around the early 80's. Quality is the personification of the culture, attitude and the values of an organisation that strives to provide the customers with the products and services which satisfy their needs. This culture insists that quality is present in all the aspects of the organisations' operations, with the processes being done right in time and defects and waste eradicated or reduced substantially from all its operations.

In order to be successful in implementing a quality management system like ISO 9001:2000, an organisation is obliged to concentrate on the eight key elements (Nayantara 1989).

- a. **Ethics:** Professional and business ethics demand that the practices followed in an organization do not harm or bring in damage to others who carry out similar activities. There should not be any attempt by the management to promote unhealthy competition or bring in enmity with other business houses.
- b. **Integrity:** The organisation has to practise a very high level of integrity within and among the employees so that they do not resort to malpractices to achieve their objectives. Professional honesty and loyalty imbibed and practised by the organisation will improve the belongingness of the employees.
- c. **Trust:** A very high level of trust is required for the growth of the organisation as the flow of information in both directions, top to bottom and bottom to top need to be controlled. Moreover the information explosion has shrunk the boundaries of the world. Maintaining the security of information as mentioned in the standards like ISMS (Information Security Management System) has become essential to combat competition.
- d. **Training:** This is a mandatory requirement for ISO 9001:2000-certified organisations. The training cycle goes through processes such as identification of training needs, implementation of training, training evaluation, retraining if required, and eventually going in for multi-skilling or job rotation as the case may be.
- e. **Teamwork:** Team work acts as the engine for the enforcement of quality. Tools such as quality circles, cross-functioning teams, suggestion schemes, etc. serve to promote team work. Team building is as much an art as it is a science and only those with leadership qualities can build a well-knit team.

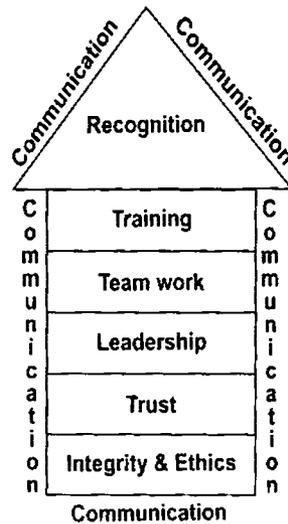
- f. **Leadership:** In order to achieve success, one has to lead from the front and the leader has to be a role model who will practise what he/she preaches. Unless the leader exhibits inborn qualities like empathy, pro-activeness, impartiality, honesty, and loyalty to the organisation, success will remain a dream for ever.
- g. **Recognition:** The contributions of the individual employees or of the teams have to be recognized and rewarded then and there. Non-monetary and monetary techniques may be deployed for recognising the efforts depending on the type, volume and the timing of the contribution. However, the dictum “justice delayed is justice denied” is applicable to recognition of the contribution too.
- h. **Communication:** This has an important role to play to achieve organizational success. While grape vine communication is to be totally discouraged, accessibility of regular employees to the higher-ups, openness in dealings and real time communication are essential for maintaining the health of the organisation.

These eight elements of a quality management system are further elaborated as follows:

A quality management system such as ISO 9001:2000 has been identified as the philosophy that ensures quality which is the driving force behind leadership, design, planning, and improvement initiatives. In order to make this happen, it requires the consolidation of all the eight key elements of the quality management systems. These can be subdivided into four groups according to their functions:

- i. **Foundation - it includes: ethics, integrity and trust.**
- ii. **Building Bricks – this consists in training, teamwork and leadership.**

- iii. Binding Mortar - it is provided with the help of communication.
- iv. Roof – this tops all the others and it is related to recognition.



**Fig. 3.2** Elements of quality management system:

*Source: Nayantara Padhi: The Eight Elements of TQM;  
[www.isixsigma.com/library/content/c\\_021230a.asp](http://www.isixsigma.com/library/content/c_021230a.asp)*

**I. Foundation:** Quality Management System is built on a foundation of ethics, integrity and trust. It fosters openness, fairness and sincerity and allows involvement of all the employees in the functioning of the organisation. This is the key to opening its ultimate potential and these three elements move together; however, each element makes its unique contribution to the system.

- a) **Ethics:** What is meant by this is the professional ethics and is related to the moral principles which take any organisation forward. It establishes a business code of conduct that specifies the guideline which all employees have to follow, in their routine functioning. Individual ethics comprises personal code of conduct which will include dress code, etiquette and manners, values and culture, etc.
- b) **Integrity:** Integrity implies honesty, values, fairness, and adherence to the codes of confidentiality and secrecy. This is what external and

internal customers expect, to receive experience in the course of doing business. The reverse of integrity can be termed as, duplicity and no QMS will thrive in such an atmosphere.

- c) **Trust** - Trust is the outcome of integrity and ethics. Without trust being present in abundance, the framework of QMS cannot be built. It allows empowerment that encourages proud ownership and enhances commitment. It also allows decision making at the appropriate levels in the organization and motivates individual risk-taking for continual improvement. The measurement carried out on the improvement of processes is taken positively and constructively. Trust is essential to promote Customer Satisfaction and it builds the friendly environment required for a quality system.

## **II. Bricks**

Based on the strong foundation of trust, ethics and integrity, bricks are stacked vertically to reach the roof of recognition. The process includes the following:

- a) **Training:** This is a very important tool which helps the employees to achieve higher levels of excellence. It enhances skills, knowledge and attitude. Skills will include interpersonal skills, intuitive skills, problem-solving skills, team-building skills etc. In this process, knowledge has to be acquired and a positive attitude is to be developed.
- b) **Teamwork:** With the magical binding of teamwork, business will find quicker and better solutions to problems. In a good team, people will feel more comfortable to work and solve problems which may occur, in a productive and consultative way. There are mainly three types of teams.

- 
- i. **Quality Improvement Teams or Excellence Teams (QIT):** These are temporary in nature and are formed with the purpose of dealing with specific problems that may often recur. These teams have a validity of three to twelve months, at the most.
  - ii. **Problem-Solving Teams (PST):** These are also temporary teams identified to solve specific problems and also to find out the root causes of problems. PSTs last from one week to three months.
  - iii. **Natural Work Teams (NWT):** An NWT consists of small groups of skilled workers who share tasks and responsibilities. They practise concepts such as Employee Involvement teams, self-managing teams and quality circles, and work for one to two hours a week, depending on the need.
- c) **Leadership:** It is possibly the most important element in the quality management system and should be omnipresent. Leadership demands the manager to provide an inspiring vision, generate strategic thinking that are understood by one and all and to instil values across the organisation. Supervisors are the front-line leaders and must be committed to lead the respective group. The leaders should practise what they preach. Leadership should trickle down from the top management to the grass-root level, if implementation of QMS is to become successful.

### **III. Binding Mortar-Communication**

This is what binds all the elements together. Right from the foundation to the roof of the house, the elements are bound by the strong mortar of communication. It acts as a vital link between the sender and the receiver, in the case of all business transactions. The success of quality management calls for

effective communication within and among all the members of the organization, suppliers and customers and interested parties. Effective communication always involves sharing of correct information at the right time in the right way. Any message delivered should be loud and clear and the receiver should understand and interpret the way the sender desired. The different types of communication are:

- a. **Downward communication:** This is a more prevalent form of communication in an organisation. Instructions, intimations, changes etc are conveyed down the line in this way.
- b. **Upward communication:** This is the route employees adopt to send across their views, suggestions and complaints to the top management.
- c. **360 degree communication:** Any communication of a matter of common interest comes under this category. Announcements related to policy, mission, achievements, short-term plans, etc. could be some of the items in this category.
- d. **One-to-one communication:** There are some business transactions which are dyadic in nature as in the case of feedback on training, performance appraisal, disciplinary actions, etc. This is totally personal in nature and is time-bound.

#### **IV. Roof-Recognition**

This is the last and very important link in the entire chain. The suggestions should be rewarded and achievements recognized on an individual and team basis. Employees crave for recognition for themselves and for their teams. Identifying and recognising personnel with creativity is one of the most critical functions of a supervisor. When people are recognized, substantial changes take place in their self-esteem, productivity, quality and the magnitude

of their effort. However, there should not be too much time delay in making recognition known to others. There are nonmonetary rewards, such as letter of appreciation from top management, publicising through in-house journals and notice boards, praising in public, awarding certificates of merit and giving higher responsibilities or positions. Monetary rewards like increased remuneration, perks, etc. are also given, depending on the quantum of the contribution.

It can be concluded that the eight elements discussed so far are instrumental in ensuring the success of a quality management system in an organisation and that the supervisor has a major role in fostering these elements in the work-place. These dimensions were taken in-to account while preparing the questionnaire to be given to the respondents in the survey.

### **3.8 Quality Journey in India**

Quality is what the customer wants and the perception of the customer influences quality. Juran, the foremost of the quality leaders, defined quality as fitness for use. It is a very concise definition indeed, for a term that has so many dimensions. In short, an expensive product does not become a quality product; on the contrary, it is its fitness for use for the customer, which makes it so.

International Organisation for Standardisation (ISO 9001:2000), the authorised body for standards formulation, was founded in the year 1946 with its head-quarters in Geneva, Switzerland. Most countries in the world are members of ISO 9001:2000. This standard is familiar to the professional community because of the unique features of the standard ISO 9001:2000, released for the first time in the year 1987. The definition of quality as per the ISO 9001:2000 standard is: “The totality of the features and characteristics of a product or service, that bear on its ability to satisfy a given or implied need”.

Quality is one of the most sensitive issues in all organisations around the world. Everyone is becoming increasingly conscious of the competitive potential of quality. India has a tradition of achieving high standards in several fields. Architectural wonders like the “Taj Mahal” and the “Konark temple” are testimonies to the rich cultural heritage that demonstrated quality. Similarly, many other products like jewellery, textiles, artifacts and ornamental articles exhibited high quality and as a result became the highly traded merchandise for other countries of the world. For several centuries, Indian trade flourished in the sale of these products. Engineering industries which were set up and run under the colonial rule, quickly established a name for quality. As reported by Piramal (1997), business families like Tata, Birla, Godrej, and Sarabhai, to name a few, started and operated several industries which have now become conglomerates and household names in India. In fact, these names are synonymous with high quality products and trust-worthiness.

However, the post-Independence era did not witness any spectacular improvement in the quality of goods and services produced in the country. According to Agrawal (1993), many positive attributes of the Indian industry have been lost due to protected business environment, and weaknesses surfaced. These weaknesses, according to the study, are: lack of trust and credibility in the working system, lack of clarity or seriousness for achieving targets, lack of precise observance of rules and norms, low quality of materials and defective components, lack of consciousness of time as money, viewing only short-term benefits in place of long term-goals, politicisation of labour unions, lack of accountability and responsibility, lack of management commitment, lack of national quality policy, inadequate economic resources, lack of indigenous technology, inadequate infrastructure, preferring quantity to quality, absence of team spirit, cartel formation, and sellers’ market concept. Besides, reduced

consumerism, Governments' total control, bureaucratic delays and thirst for making quick profits by the business houses, resulted in quality getting a low priority. Consequently Indian products were constrained to serve only the domestic market and were unable to compete in the international markets. Further, the factors mentioned above have clearly been clearly proved to be the obstacles in the path to progress. India, in spite of possessing good resources and rich scientific and technical manpower, could not produce world-class products acceptable to international markets.

### **3.9 Evolution of quality initiatives in India**

It was in the early eighties that the Confederation of Indian Industries (CII) kicked off its pioneering efforts to promote awareness about quality among Indian industries. In 1982, quality circles took birth in India, and the pioneers to launch this magic tool were Bharat Electronics Limited, Bangalore, and Bharat Heavy Electricals Limited, Trichy. In 1986, the CII, then known as CEI (Confederation of Engineering Industries), invited Professor Ishikawa of Japan to India, to speak about quality to the Indian industrialists. Later in 1987, a quality division was set up by CII and this division owed its birth to twenty-one organisations which agreed to support the cause by pooling of resources and pledging to start the journey towards quality. Their chief executives formed the National Committee on Quality, and quality month was celebrated as an annual event. CII also launched the first newsletter on quality.

In 1987 and 1988, the CII invited the Juran Institute to conduct three workshops in India. In 1989, a team from India attended the Deming Seminar in London. Study teams organised by the CII were taken to Japan and USA to learn quality practices. In 1990, the CII consolidated and focused on training

programmes in India. It organized the launch of the National Quality Campaign led by the Prime Minister of India, in May 1992. It was around this time that the policy of globalisation and liberalisation was adopted in India, bringing a new dimension to the business and industrial sectors. Thereafter, a new line of thinking in terms of quality, productivity, and competitiveness emerged. Since 1993, the CII has been organising the quality summit every year. This provided an opportunity for the business leaders, and the senior managers of the member and non-member organisations of CII to network, learn, and contribute through experience sharing, and listening to the experts. The National Productivity Council (NPC) set up a quality and benchmarking division in New Delhi, and offered quality implementation services, which included modular training programmes and consultancy services.

In 1997, the Government of India announced the setting up of the Quality Council of India (QCI) under the Ministry of Industries, providing 50 % of the seed capital of Rs. 1.5 crore. The rest of it was contributed by the corporate sector. The setting up of a national agency for quality certification was done as a part of the World Trade Organisation (WTO) agreement, under which member countries could not trade in noncertified products for two years down the line. The corporate sector too was demanding the setting up of an internationally recognised quality council, as it was found that the certification process from foreign agencies was too expensive. Besides, it would save vital foreign exchange for the country. The QCI was entrusted with the monitoring and administering of the National Quality Campaign and it did oversee the functioning of the National Information and Enquiry Services in an effective way.

### **3.10 Implementation of Total Quality Management**

The first step in the implementation of TQM is the executive decision to be taken by the top management to adopt this approach. Once this is done, a core team is formed to steer the whole process right from the beginning till the end. There will be a vision-building exercise involving all the senior functionaries to chalk out the objectives, plan of action and the effort to be put in for innovation and arriving at the improvement goals. Formation of cross-functional teams involving all the related functions and allocation of specific portfolios to the top management personnel will kick-start the process. Timely and periodical review by the MD or the CEO will discover the lacunae in the system and the scheduled management review meeting will be able to oversee the progress of corrective and preventive actions taken. Once the system is put in place, the top management can take an audit, and on satisfactory completion of the audit, they can decide whether they need to apply for an award. Some of the quality awards are Deming Prize, Malcolm Baldrige National Quality Award, CII-EXIM Award, Rajiv Gandhi Award etc. The review committee will evaluate the organisation from the point of view of People-results, Continual Improvement achieved, Social results, ROI, etc.

This chapter will describe the concepts and definitions used, methodology of collection of data, sample design, analytical frame-work, statistical tools used and the limitations of the method used.

## **4.1 Research Design**

Research design outlines how information is to be gathered for an assessment or evaluation that includes identifying the method of acquisition of the data, the instruments to be used, how these will be administered, and how the information will be organized and analyzed. The following gives an account of the various logical steps adopted by the researcher to finalise the research design

### **4.1.1 Concepts and definitions:**

The concepts and definitions used in this thesis are as follows:

**Dimensions:** The constructs of quality referred in manual IS/ ISO 9001:2000.

**Attributes:** The individual elements of the dimensions

**Organisation:** This refers to private, public limited, Government-owned (Kerala state and Central Government) industrial and research establishments.

**Respondents:** The employees who are in permanent service in the organizations surveyed.

**Quality:** What gets reflected in the output in terms of levels of acceptance, rework and rejection.

**Customer:** Internal customers, external customers and competitors' customers.

**Management Commitment:** Mandatory responsibility of the management to look after the employees and their prospects.

**Employee Involvement:** Voluntary engagement of the employee for the betterment of the organisation and the individuals.

**Innovation:** Action taken to better achievements through creative thinking.

**Customer complaints:** The end result of a gap between what is promised and what is delivered to the customer.

**Reprimanding:** Punishing the defaulters.

**Self Improvement:** A conscious improvement through self-effort.

**Continual Improvement:** Improvement which is everlasting

**Establishment of objectives:** Firming up of planned actions.

**Monitoring and Measurement:** A tool to assess performance.

**Documentation:** Systematic recording of events.

**Cause and Effect Analysis:** A method to find out reasons for any occurrence.

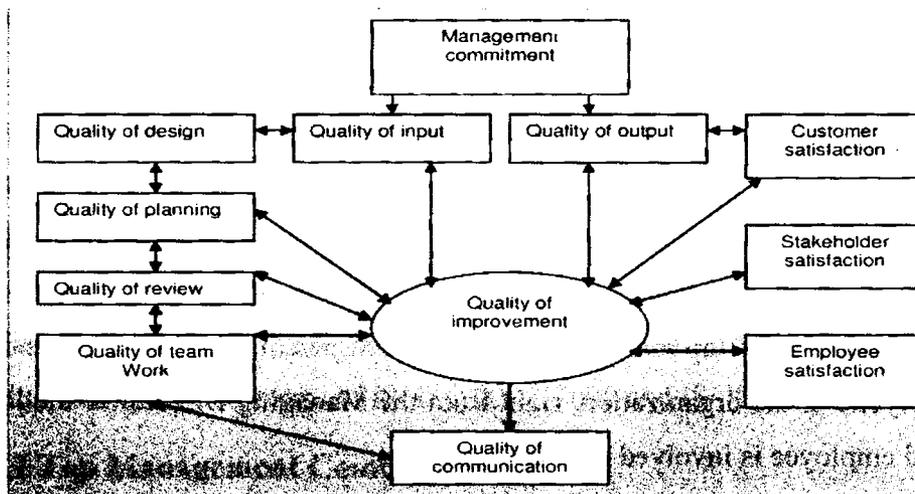
**Shared Vision:** Collective thinking.

**Cost of Quality:** Cost to be borne on account of defects.

## **4.2. Focus of Quality Management System**

The focus of the quality management system in an organisation is the customer. The customers' need will keep changing and the organization will have to tune to their changing needs. Quality is distributed over the various

stages right from the design, planning, execution, inspection, review and packing and dispatch, in the case of the products. Management commitment encompasses all these areas and ensures that the quality of the output matches with the requirements put down by the customers. Over and above the customer, there is another group called the interested parties, who are also concerned about the quality, profitability and growth of the organization. This includes employees, shareholders, suppliers, banking institutions and the public. Improvement is an absolute necessity for any organization which has adopted quality management practice. This also could be implemented either in steps or in a break-through mode. An effective quality management system will have the touch points as given in Exhibit 4.8



**Fig 4.1 Quality Management Framework**

*Source: Clauses 5.2, 5.4, 5.6 & 7.3 of IS/ISO 9001:2000 & 5.1.2, 5.4.2, 5.6 & 7.3 of IS/ ISO 9004: 2000) (pp. 5-8) of Indian Standard Quality Management Systems-Guidelines for Performance Improvements (Fifth Revision).*

### **4.3 Development of Questionnaire**

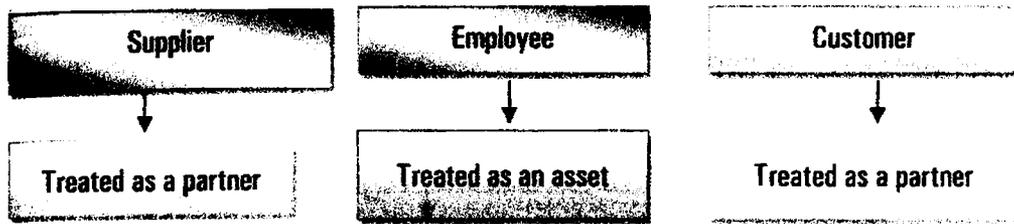
The questionnaire was framed so as to get the necessary inputs from the respondents on the level of quality management practices followed in their respective organizations so that comparison could be drawn between the quality practices of ISO 9001:2000-certified organizations as well as that of organisation without this certification. The questionnaire was developed based on the quality clauses stated in the documents IS/ISO 9001:2000 and IS/ISO 9004: 2000, the works of previous researchers, the pilot study conducted by the research scholar, his experience in implementing ISO 9001: 2000, in a few companies. The questionnaire is appended in Annexure II.

### **4.4. Overview of the dimensions of quality considered in the study**

ISO 9001:2000 is the management approach of an organisation centred on quality, based on the participation of its members and aiming for a long-term success through Customer Satisfaction. It benefits all the employees of the organisation and the society as well. It is an overall strategy which is formulated at the top management level which percolates to the rank and file. Everyone in the organization, right from the Managing Director to the lowest paid employee is involved in this process.

ISO 9001:2000 encompasses not only the external end users and suppliers of the products or services but also the internal customers who work in the other departments. Any task is seen as a process and a process approach will be built into the system. The process of improvement is applicable for

individuals as well as groups. There is a set of principles and concepts, which can be pictorially represented as in exhibit 4.1.



**Exhibit: 4.1** Flowchart of Quality Management System

*Source: "Process approach" under clause 0.2 of Introduction of IS/ISO 9004:2000 (pp. iii -v) under Introduction of Indian Standard Quality Management Systems- Guidelines for Performance Improvements. (Fifth Revision)*

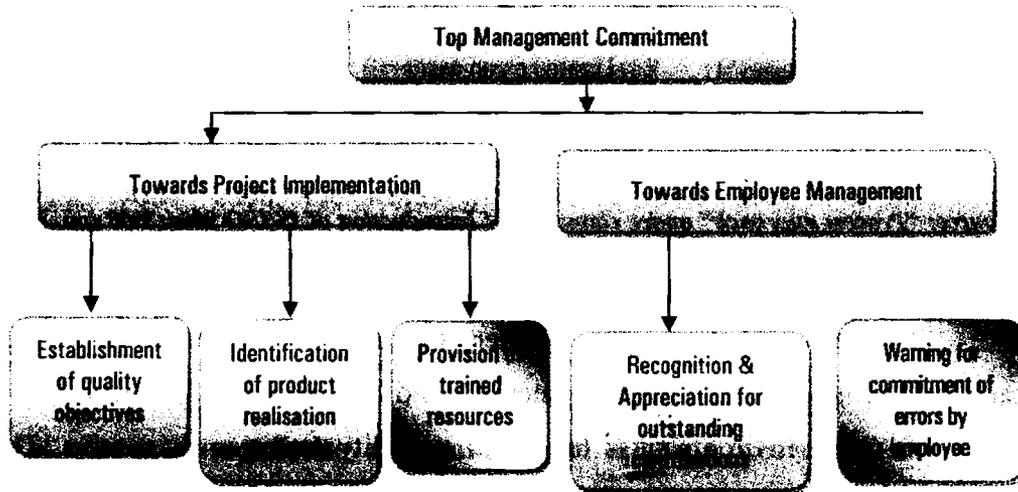
The relation between the supplier and the management, the employer and the employee, and the customer and the service provider in a ISO 9001:2000 environment is unique in a quality management system. The International Organisation for Standardisation (ISO 9001:2000) defines quality management system as a management approach for an organisation, centred around quality, based on the participation of all its employees and aims at long-term success through Customer Satisfaction, cost reduction, waste reduction, and increased efficiency of the services. The dimensions and the attributes under each dimension listed below are stated in the requirements of quality management systems of IS/ ISO 9000: 2000 and IS/ ISO 9004: 2000.

#### **4.4.1 Top Management Commitment**

The involvement of the top management in all decision-making processes and their implementation helps to reinforce quality. The top management should take the initiative to not only to finalise the business strategy, but also to use quality of the end product as the force to reckon with. Achievers are to be rewarded suitably and in time, lest they should become sluggish, sooner or later. Similarly,

non-performers are advised and helped to come out of the red at the earliest. Providing training to the employees will enhance their overall capability.

The block diagram given in Exhibit 4.2 represents the attributes of top management commitment.



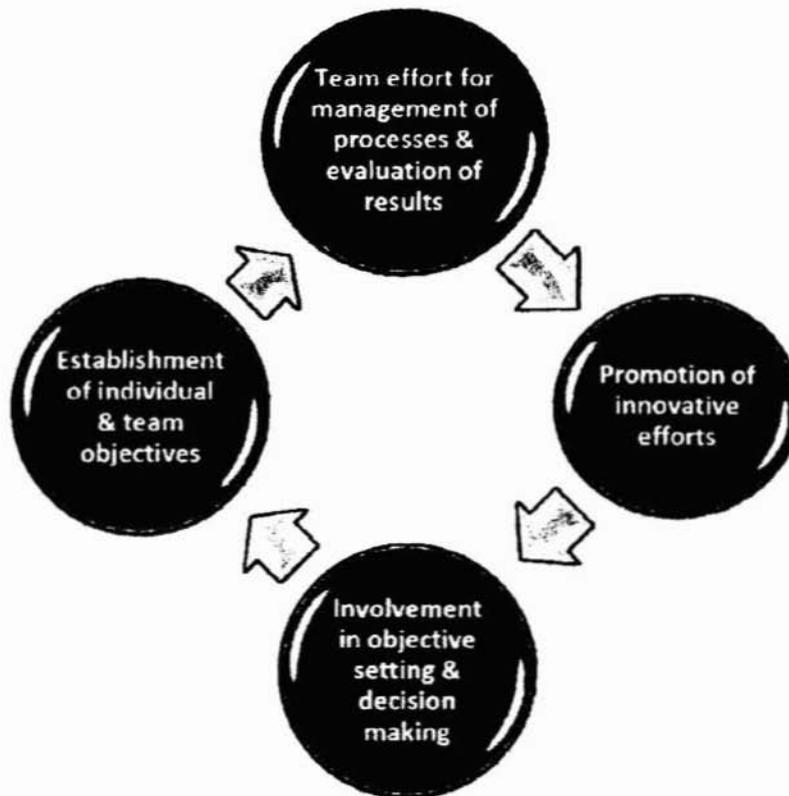
**Exhibit: 4.2.** Attributes of top management commitment

*Source: "Management commitment" under clauses 4.1, 5.1, 6.1, 7.1 of IS/ISO 9001:2000 & clauses 6.1, 7.1 of IS/ISO 9004:2000 (pp. 4 - 23) of Indian Standard Quality Management Systems-Guidelines for Performance Improvements (Fifth Revision).*

#### **4.4.2 Employee Involvement**

Participation of the employees in all the activities of the organisation helps to create a synergetic effort in building a team. A feeling of ownership and belongingness is created, when participation is ensured from all sections of the employees. This also moots responsibility and accountability.

The attributes of Employee Involvement can be presented schematically as in Exhibit 4.3



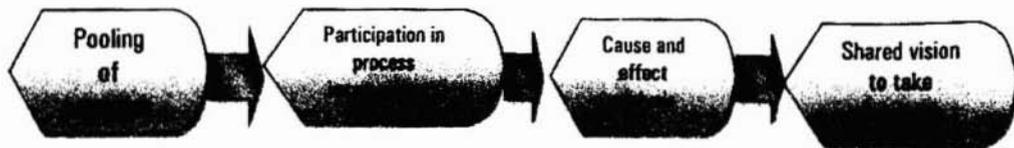
**Exhibit: 4.3.** Attributes of employee involvement

*Source: "Involvement of people" under clause 6.2.1 of IS/ISO 9004:2000 & 6.2.2 of IS/ISO 9001:2000 (pp. 15-17) of Indian Standard Quality Management Systems- Guidelines for Performance Improvements (Fifth Revision).*

#### 4.4.3 Team Working

Belbin (Hubert 2000) has defined different roles for the members in a team, keeping in mind their specific skills and attitudes. Team Working gives instant energy, which is to be maintained through continued efforts. The need for Team Working is stressed in ISO 9001:2000 standards.

When the attributes of Team Working are put together, it will look like what is represented in Exhibit 4.4

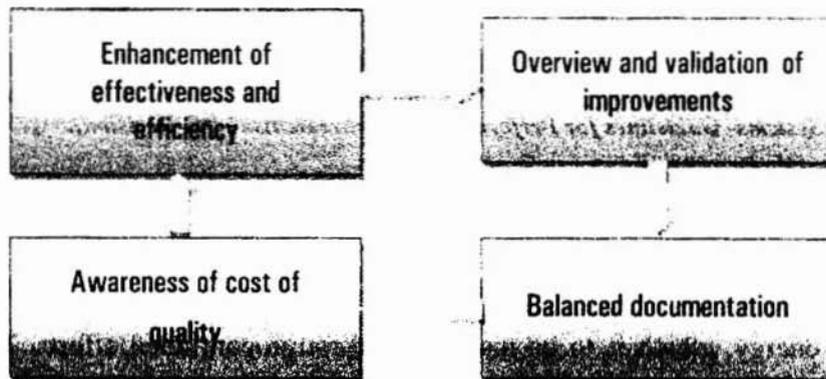


**Exhibit: 4.4.** Attributes of team working

*Source: "Team working" under clause 8.4 of IS/ ISO 9001:2000 & 5.1.1, 6.2.2.2 of IS/ISO 9004:2000 (pp 5 - 42) of Indian Standard Quality Management Systems-Guidelines for Performance Improvements (Fifth Revision).*

#### 4.4.4 Continual Improvement

Continual Improvement is the hallmark of a quality management system. Quality circles, cross-functional teams, suggestion-schemes, brain-storming sessions, and case studies assist the implementation of continual improvement. In order to ensure the future of the organisation and satisfaction of all agencies including the customers, the management creates a culture for improving the performance of processes and products. This will be periodically reviewed in the Management reviews and necessary corrective actions taken. Exhibit 4.5 represents the distribution of the attributes of continual improvement.



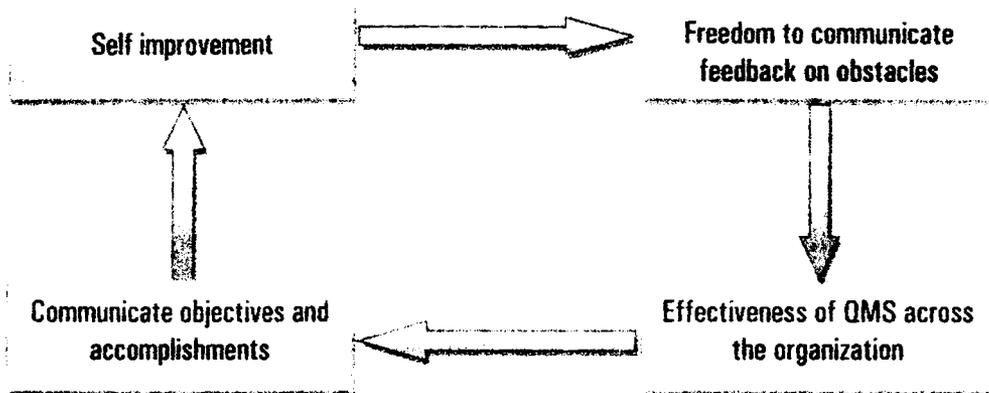
**Exhibit: 4.5.** Attributes of Continual Improvement

*Source: "Continual improvement" under clauses 8.5.1 8.5.2 of IS/ISO 9001:2000 & 5.6.1, 8.5.4 of ISO 9004: 2000 (pp 12 - 44) of Indian Standard Quality Management Systems- Guidelines for Performance Improvements (Fifth Revision).*

### 4.4.5 Internal Communication

Communication is the gateway for transmission of information and transparency and clarity are essential to avoid grapevine communication. The freedom to communicate will improve cohesion among the employees.

Exhibit 4.6 gives a pictorial representation of the attributes of Internal communication.



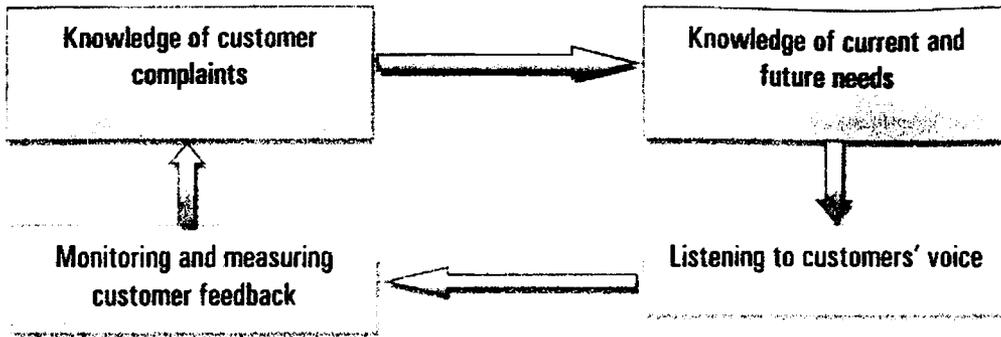
**Exhibit: 4.6.** Attributes of internal communication

*Source: "Internal communication" under clause 5.5.3 of IS/ISO 9001:2000 & 5.1.1, 5.5.3 of IS/ ISO 9004: 2000 (pp. 5-12) of Indian Standard Quality Management Systems-Guidelines for Performance Improvements (Fifth Revision).*

### 4.4.6 Customer Satisfaction

The growth of an organisation depends on customer loyalty, to a very great extent. Collection of periodical feedbacks from the customers and taking corrective and preventive actions on these will instill more confidence in them.

The attributes of Customer Satisfaction are well described in the Exhibit 4.7.



**Exhibit: 4.7** Attributes of Customer Satisfaction

*Source: "Customer Satisfaction" under clauses 5.2& 7.2 of IS/ISO 9001:2000, & 5.1.2, 8.1.2(e), 8.2.1.2 of IS/ISO 9004:2000 (pp. 8 - 35) of Indian Standard Quality Management Systems- Guidelines for Performance Improvements (Fifth Revision).*

## 4.5 Sample design

The technique employed for sample design was a two-stage process. The first stage of selecting the organisation was done through convenience sampling and these were selected to represent the population of industries in Kerala, based on their permission to conduct the survey.

In the second stage, the selection of employees was also done through convenience sampling depending on their availability and willingness to participate.

### 4.5.1 Data collection

The method of data collection was through a sample survey of industrial and R & D units identified as explained above. The organisations for the collection of the data were chosen in such a way that a wide spectrum of the research and business activities undertaken in Kerala has been covered. This included aerospace activities of ISRO, glassware, civil and electrical construction, health care, etc. The organisations selected included public limited companies, those run by Govt. of India and Govt. of Kerala, and private limited companies. Out of the twenty-four

organisations, twelve had ISO 9001:2000-certification and the rest were not certified by ISO 9001:2000 standards. The details of the organizations are given in Annexure I. The collection of data was done through a perception survey of a cross section of employees from these organizations. In total, 25 questions were framed to cover all the aspects of quality management practices. While collecting the data, the purpose of the exercise was explained to the willing employees and the questionnaire was administered to a group of twenty employees from both categories of organizations, initially. This was done to pretest the questionnaire. In this process, it was ensured that the employees were able to understand the meaning of the terms used in the questionnaire. Based on the feedback, five questions were modified. The questions were made on a five point-scale and these were explained to the employees, prior to their filling up the questionnaire. The questions were arranged in such a way as to avoid respondent bias.

Initially, 1120 respondents from both categories of organisations were contacted for the survey, out of which only 1012 responded. From the data obtained from this group, some were incomplete and some not useful. Such of those were discarded and finally the useful data worked out to 877 in number. Out of these 444 observations was from ISO 9001:2000 -certified organizations and the rest 433 from the other category.

#### **4.6. Analytical Framework**

As explained earlier, the responses of the employees are recorded on a five-point Likert scale with the codes, strongly agree, weakly agree, undecided, weakly disagree and strongly disagree. The responses are given codes 5 to 1, in order to assess the levels of agreement or disagreement, as the case may be.

## 4.7 Reliability and Validity

The instruments are validated by:

- Verifying the variables selected with those used by the previous researchers (*Din Thai Hoang, Barbara Igel and Tritos Laosirihongthong, 2006, Jaideep Motwani, 2001, Subbash Kakkar, and Narag, A.S., 2007, Shari Mohd Yusof and Elaine Aspinwall, 1999, Zheiwei Zhu & Larry Schewermann 1999, Ahire,S.L., Golhar, D.Y., and Waller, M.A., 1996, and Zhahai Zhang, 2000*);
- Consulting experts and knowledgeable persons in the field.

The collected data were tested to check the reliability of the tool using Cronbach's alpha test, for the variables in the respective groups of dimensions and the values are as follows:

- |                             |      |
|-----------------------------|------|
| • Top Management Commitment | 0.71 |
| • Employee Involvement      | 0.74 |
| • Team Working              | 0.77 |
| • Continual Improvement     | 0.79 |
| • Internal Communication    | 0.81 |
| • Customer Satisfaction     | 0.71 |

## 4.8 Analysis of data

The analysis starts with the comparison of the patterns of the responses of the employees of the two types of organizations. To find out whether the patterns are different or not, chi square test was carried out. The levels of agreement or disagreement for each of the questions were assessed from the mean of the responses. Each question represents a variable, which is an indicator of the respective attribute of the dimension tested. To check whether there was significant difference or not for the means, between the two categories, an independent sample

t- test was conducted. The level of significance was assumed to be 5 %. The difference between the means of the two categories of responses, as seen from the test would decide whether the difference was significant between the two categories or not, as far as this mean is concerned. In order to find out whether any association existed between the variables in the group a correlation analysis was conducted. Whenever the values of correlation coefficient were less than  $\pm .300$ , it could be assumed that the strength of relation between the two variables was low. However, the significance of the relation between the attributes or variables was decided by the p- value. Whenever the absolute value of the correlation was  $.300$  or above, factor analysis was conducted to find out the underlying factors. After initial extraction of scores, factor rotation analysis was resorted to, for closely identifying the factors which were independent of one another. Each hypothesis is related to a specific dimension. The overall index of each dimension was evaluated as the average of the values of the various attributes of the respective dimension. Based on the testing of the hypothesis, conclusions could be drawn on the relative level of existence quality management processes in both types of organisations. This would help to decide whether the hypothesis could be accepted. Based on its value in comparison to the table value at 5% level of significance, it would be concluded whether the hypothesis can be accepted.

#### **4.9. Statistical tools used for Analysis**

The questionnaire was framed so as to get the perception of the respondents to the six quality dimensions or constructs, namely top management commitment, employee involvement, team working, continual improvement, internal communication and Customer Satisfaction. The questions which related to each quality dimension were grouped later and the responses analysed with the help of version 16 of SPSS software. The statistical tools used for the study were

Chi square test, Cronbach's alpha test, independent sample t-test, correlation analysis, and factor analysis, the details of which are explained in Chapter V.

#### **4.10 Summary**

The organizations were selected based on the following considerations:

- Familiarity of the researcher with the top management of the institutions through working with them or having association as a trainer.
- Willingness of these establishments to grant permission for conducting a survey.
- Anticipated co-operation from the employees to participate in the survey.

The survey was conducted during the period, April 08 to June 08.

Out of the total of 877 samples 444 numbers were from ISO 9001:2000-certified organizations and the rest 433 from those without ISO9001:2000 certification. The researcher collected the information from CII Kochi in person, on the number of organisations in Kerala as on 31 March 2007, and those who had been certified for ISO 9001:2000 till then to the same scale. The figures were 13,000 and 400 respectively and these represented the universe and the sample size.

The dimensions and the framework developed and presented in Chapter 4 for the quality management system is taken as the reference for working out the detailed analysis and interpretation of the data collected, which have been duly tested with the help of the statistical tools mentioned later.

### **5.1. Socio-educational stature of the respondents**

The socio economic profile of the respondents is presented in Table 5.1

**Table: 5.1**  
**Gender of the respondents (*Data based on the survey*)**

<b>Sl. no</b>	<b>Gender</b>	<b>No of Respondents</b>	<b>Percentage</b>
1	Male	668	76.17
2	Female	209	23.83
3	Total	877	100

From Table 5.1, it can be seen that 76.17% of the respondents belonged to the male category. It is presumed that this blend will rule out any biased perception due to the difference in the gender.

Table 5.2 gives the age profile of the respondents.

**Table: 5.2**  
**Age of the respondents (Data based on the survey)**

Sl. No	Age	No. of Respondents	Percentage
1	Below 30 years	497	56.67
2	31 – 35 years	73	8.33
3	36 – 40 years	58	6.67
4	41 – 45 years	88	10.00
5	46 – 50 years	58	6.67
6	51-55 years	73	8.33
7	Above 55 years	29	3.33
8	Total	877	100

Table 5.2 indicates that 56.67 % of the respondents belonged to the age group of 30 years and below. 10 % of the respondents fell in the age group of 41-45 years, and 8.33 % in the age group of 31-35 years as well as 51-55 years. 6.67 % each of the respondents belonged to the age group of 36-40 years and 46-50 years, and 3.33% of the respondents were aged 55 years and above. This sample is a good mix of senior people and youngsters. Out of the twenty-four organizations surveyed, fourteen organizations were fairly young, whereas the others had been in business for around thirty years and more. The respondents were selected in such a way as to have a comparable age structure.

Table 5.3 accounts for the details of the educational qualification of the respondents.

**Table: 5.3**  
**Educational qualification of the respondents (Data based on the survey)**

Sl.No.	Educational qualification	No. of respondents	Percentage
1	Matriculation or below	17	1.94
2	Technical training (certificate)	137	15.62
3	Diploma	79	9.01
4	BA/BSc/B. Com	59	6.73
5	B Tech/M.Sc/M.Com	205	23.38
6	M Tech	92	10.49
7	Others	288	32.83
8	Total	877	100

It can be seen from the Table 5.3 that 23.28 % of the respondents held B.Tech/ other post graduate qualifications, followed by 15.62 % of the respondents with technical qualifications. There were 10.49 % of the respondents who had passed M.Tech. Diploma holders and matriculates constituted 6.73% and 1.94% respectively. The rest of the respondents had other qualifications. Organisations like M/s VSSC/ISRO, Terumo Penpol, Hindustan Latex, Bhagheeratha Engineering, etc. have employees with higher qualifications, whereas the rest of the organizations surveyed had more representation of workers and supervisors. The sample reflects this feature.

The profile of the experience of the respondents is given in Table 5.4.

**Table: 5.4****Years of experience (Data based on the survey)**

Sl.no	No. of years	No. of respondents in ISO 9001:2000 certified organisation (%)	No. of respondents in organisations which are not certified by ISO 9001:2000 (%)	Total (%)
1	1-5	50(5.67)	48(5.53)	98(11.19)
2	6-10	54(6.21)	53(6.06)	108(12.27)
3	11-15	61(6.97)	60(6.80)	121(13.76)
4	16-20	65(7.39)	63(7.21)	128(14.59)
5	21-30	69(7.89)	67(7.70)	137(15.59)
6	31-35	71(8.10)	69(7.90)	140(16.00)
7	Above 35	74(8.40)	72(8.19)	145(16.58)
8	Total	444(50.63)	433(49.37)	877(100)

*Note: The figures given in parentheses are the percentage of respondents.*

From the Table 5.4, it can be seen that 16.58% of the respondents in both the categories put together had over 35 years of work experience. Similarly, 16% had experience from 31-35 years, 15.59% ranged from 21-30 years. In the range of 16-20 years, there were 14.59%. 13.76% and 12.27% of the respondents had 11-15 and 6-10 years of work experience respectively. Balance 11.19% of the respondents had a limited experience of 1-5 years. The experience quoted combines the experience within the organisation presently being served and the earlier ones.

The Table 5.5 depicts the occupation-based distribution of the respondents in both the categories.

**Table: 5.5**

**Occupational status of the employees (Data based on the survey)**

<b>Sl. no.</b>	<b>Occupation</b>	<b>No. of respondents</b>	<b>Percentage</b>
1	Workers	142	16.20
2	Officers	153	17.40
3	Managers	298	34.00
4	Skilled Technicians	284	32.40
5	Total	877	100

Table 5.5 indicates that out of 877 responses received, which were complete in all respects, 34% were represented by officers and managers. Workers constituted 16.20% and the rest were skilled technicians (32.40).

## **5.2. Analysis of survey data**

### **5.2.1 Analysis of Top Management Commitment**

Top Management Commitment can be considered as excellent, if the following attributes are in place:

- Identification of product realisation processes,
- Recognition and appreciation for outstanding contributions,
- Warning for commitment of errors by the employee,
- Establishment of quality objectives, and
- Provision of trained resources,

These are reflected in the question numbers 6, 7, 8, 14 and 24 of the questionnaire. To examine the reliability of the responses received for the questions framed for Top Management Commitment, Cronbach's alpha test was carried out. The value obtained was 0.71 and this indicated good reliability. It is

the responsibility of the top management to identify the processes for the product realization, which are value-adding in nature. Careful implementation of such processes will result in improved efficiency and effectiveness. Concurrently, the productivity will also get increased. The employees are appreciated, recognized and rewarded for good work, which is one of the obligations of the top management. However, the employees whose performance is not satisfactory are reprimanded as well. The quality objectives are established by the top management and the realisation of these will call for the availability of trained resources. This is one of the mandates of the top management.

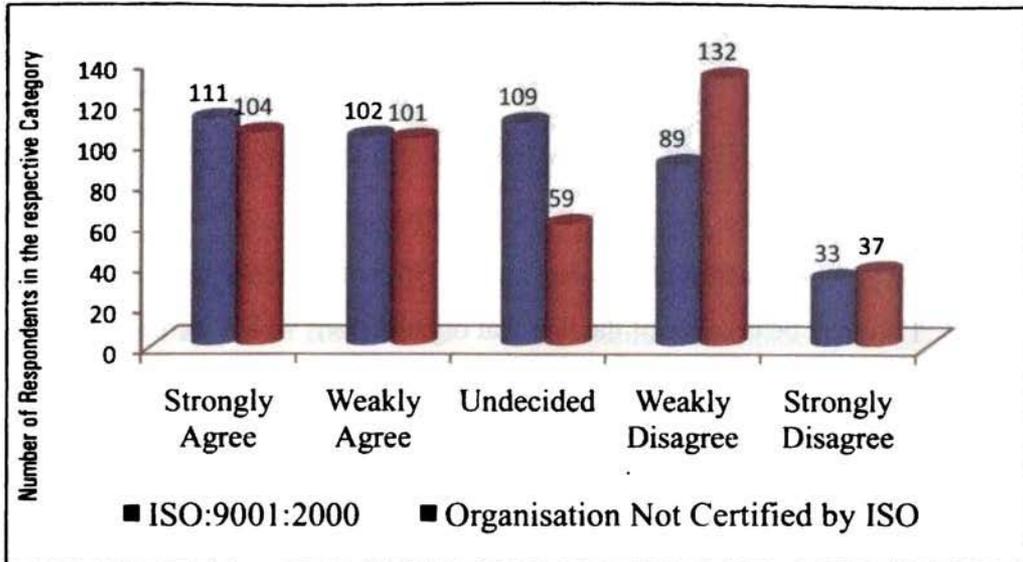
The response to question no.6 will give an idea of the comparison of the effort taken by the top management in identifying product realization processes which add value, in ISO 9001:2000-certified organizations as well as in those not certified by ISO 9001:2000 standards. The feedback from the respondents on the Likert's five-point scale, in the case of these organizations, is given in Table 5.6 and the pictorial representation of this data is given in Exhibit 5.1.

**Table: 5.6 (Question 6)**  
**Distribution of responses from the employees on identification of product realisation processes (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	$\bar{X}$	S.D.	Sig (2 tailed)
ISO 9001:2000 Certified	111 (25)	102 (22.97)	109 (24.55)	89 (20.05)	33 (7.43)	444 (100)	3.38	1.26	.104
Not Certified by ISO 9001:2000	104 (24.0)	101 (23.33)	59 (13.63)	132 (30.49)	37 (8.55)	433 (100)	3.24	1.33	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.1 gives the distribution of responses from the employees on identification of product realisation processes, in a pictorial fashion.



**Exhibit: 5.1** Distribution of responses from the employees on identification of product realisation processes.

From Table 5.6 and Exhibit 5.1, it can be seen that 27.48% of the employees in ISO 9001:2000-certified organisations reported lack of identification of product realisation processes which were value-adding in nature in their organisations, as against 39.04% of the respondents in organisations which were not certified. It is also seen that organizations certified by ISO 9001:2000 had a comparatively high percentage of respondents who were undecided, as far as this attribute is concerned. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 23.6 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. The mean of responses was computed to assess the level of agreement

or disagreement. To check whether the difference of means is significant or not, an independent sample t-test was carried out. The values of mean responses are 3.38 and 3.24 for ISO 9001:2000-certified organisations and for those which are not certified by ISO 9001:2000 respectively. The difference between the two means is found to be not significant, as seen from the value of the significance in the 2-tailed test indicating that there is no difference in the existence of product realization processes which adds value, in both types of organisations.

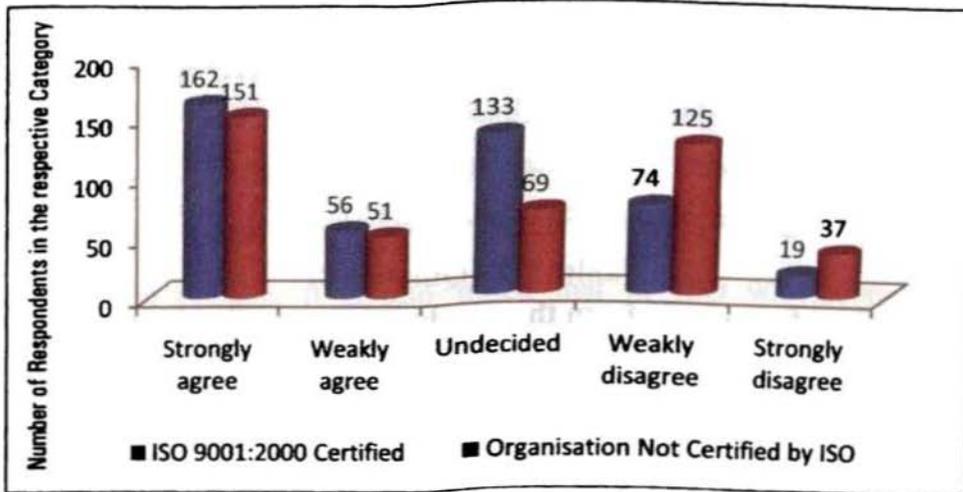
This may be because of the fact that organisations which were not certified by ISO 9001:2000 took special efforts to demonstrate management commitment, to compensate for the non-availability of any label of quality for them. ISO 9001:2000-certified organisations seem to take the matter less seriously, over a period of time. Table 5.7 denotes the Distribution of responses from the employees on recognition and appreciation for outstanding contributions and the pictorial representation of this data is given in Exhibit 5.2.

**Table: 5.7 (Question 7)**  
**Distribution of responses from the employees on recognition and appreciation for outstanding contributions (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	162 (36.49)	56 (12.62)	133 (29.96)	74 (16.66)	19 (4.27)	444 (100)	3.70	1.25	.006
Not Certified by ISO 9001:2000	151 (34.87)	51 (11.78)	69 (15.94)	125 (28.86)	37 (8.55)	433 (100)	3.35	1.42	.006

*Note: The figures given in parentheses are the percentages of the responses.*

Distribution of responses from the employees on recognition and appreciation for outstanding contributions is presented pictorially in Exhibit 5.2.



**Exhibit: 5.2** Distribution of responses from the employees on recognition and appreciation for outstanding contributions.

As seen from Table 5.7 and Exhibit 5.2, 20.93% of the employees in ISO 9001:2000-certified organisations do not subscribe to the view that the employees are recognized and appreciated for the good work done in their organisations, as against 37.41% in organisations not certified by ISO 9001:2000. The ISO 9001:2000-certified organisations, had a comparatively higher percentage of employees undecided on this question. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 39.6 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

The mean responses were computed; the values were 3.70 and 3.35 respectively for ISO 9001:2000-certified organisations and those not certified by ISO 9001:2000, respectively. To check whether the difference of means is significant or not, an independent sample t-test was carried out. The difference between the two means as seen from the value of significance in the 2-tailed test was significant indicating that recognition and appreciation for outstanding

contribution is not the same in the two types of organisations. This could be because the ISO 9001:2000-certified organizations have a better system to recognize contribution of their employees. Distribution of responses from the employees on warning for commitment of errors by employee is given in Table 5.8 and the pictorial representation of this data is given in Exhibit 5.3.

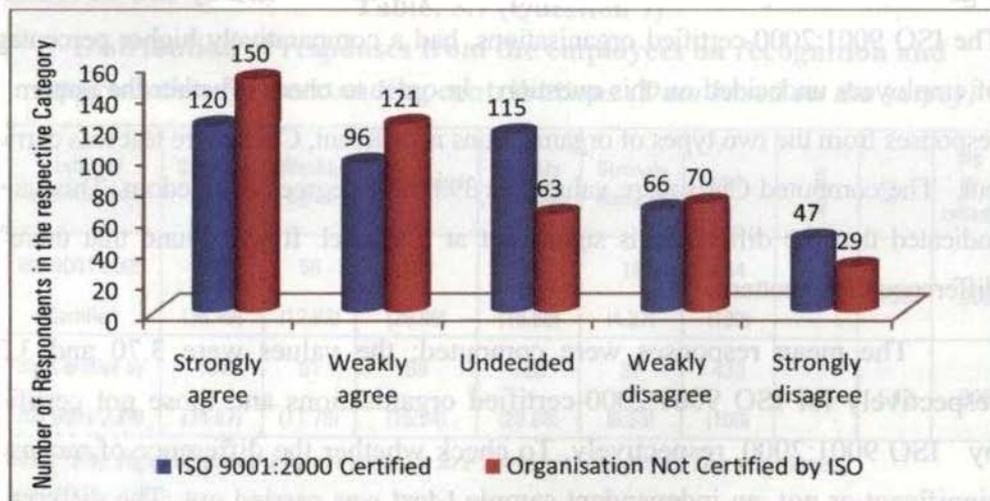
**Table: 5. 8 (Question 8)**

**Distribution of responses from the employees on warning for commitment of errors by employee (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2tailed)
ISO 9001:2000 Certified	120 (27.02)	96 (21.62)	115 (25.90)	66 (14.87)	47 (10.59)	444 (100)	3.76	1.31	.001
Not Certified by ISO 9001:2000	150 (34.64)	121 (27.94)	63 (14.55)	70 (16.17)	29 (6.70)	433 (100)	3.67	1.28	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.3 gives the distribution of responses from the employees on identification of product realisation processes, in a pictorial fashion.



**Exhibit: 5.3** Distribution of responses from the employees on warning for commitment of errors by employee.

From Table 5.8 and Exhibit 5.3, it can be noted that 25.46% of the employees in ISO 9001:2000-certified organisations do not think that, in their organizations, the employees are reprimanded when the results are not satisfactory. As against this, 22.87% of the employees in the other category have the same opinion. It is also noted that in ISO 9001:2000-certified organisations comparatively higher percentages of employees are undecided on this question.

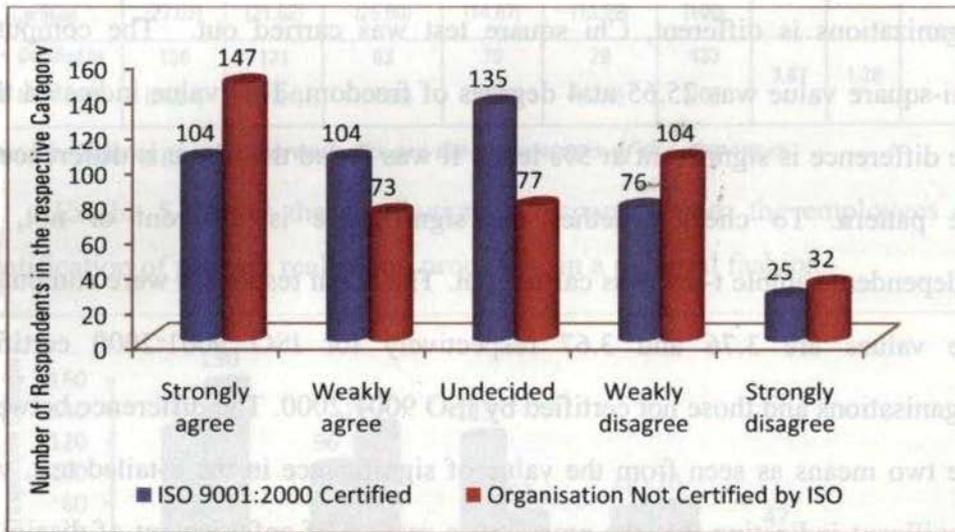
In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi-square value was 25.65 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the significance is different or not, an independent sample t-test was carried out. The mean responses were computed; the values are 3.76 and 3.67 respectively for ISO 9001:2000 certified organisations and those not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test, was significant indicating that the practices in respect of enforcement of discipline are different, in the two types of organizations. It can be inferred that organisations not certified by ISO 9001:2000 practise better enforcement of discipline. Table 5.9 gives Distribution of responses from the employees on establishment of quality objectives and its pictorial representation is given in Exhibit 5.4.

**Table: 5.9 (Question 14)**  
**Distribution of responses from the employees on**  
**establishment of quality objectives (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	104 (23.42)	104 (23.42)	135 (30.42)	76 (17.11)	25 (5.63)	444 (100)	3.41	1.18	.637
Not Certified by ISO 9001:2000	147 (33.95)	73 (16.86)	77 (17.79)	104 (24.02)	32 (7.39)	433 (100)	3.46	1.34	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.4 gives the distribution of responses from the employees on Establishment of quality objectives.



**Exhibit: 5.4** Distribution of responses from the employees on Establishment of quality objectives.

Table 5.9 and Exhibit 5.4 demonstrate the fact that 22.74% of the employees in ISO 9001:2000-certified organisations opined that quality objectives are not established by the top management in their organisations as against 31.41% of employees in organisations not certified by ISO 9001:2000. Similarly, ISO 9001:2000-certified organisations have a comparatively high percentage of

employees undecided on this question. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 33.74 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference of means is significant or not, an independent sample t-test was carried out.

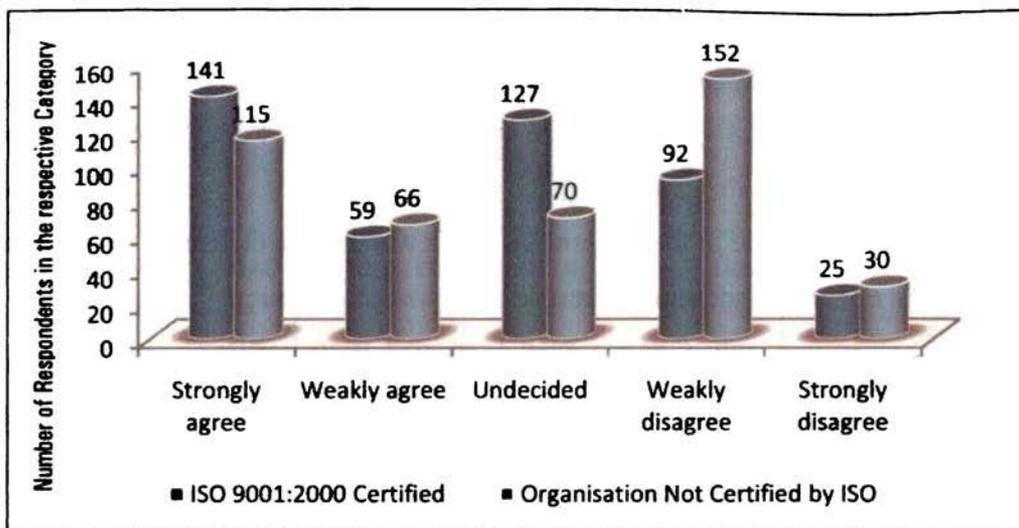
The mean responses were computed; the values were 3.41 and 3.46 respectively for ISO 9001:2000-certified organisations and not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant. This indicates that there is no difference in the effort taken by the top management in the establishment of quality objectives, between the two types of organisations. Table 5.10 gives Distribution of responses from the employees on provision of trained resources. Its pictorial representation is given in Exhibit 5.5.

**Table: 5.10 (Question 24)**  
**Distribution of responses from the employees on provision of**  
**trained resources (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 - Certified	141 (31.75)	59 (13.28)	127 (28.60)	92 (20.73)	25 (5.64)	444 (100)	3.75	1.28	.004
Not certified by ISO 9001:2000	115 (26.56)	66 (15.24)	70 (16.17)	152 (35.10)	30 (6.92)	433 (100)	3.20	1.34	

*Note: The figures given in parentheses are the percentages of the responses*

Exhibit 5.5 provides the distribution of responses from the employees on provision of trained resources.



**Exhibit: 5.5** Distribution of responses from the employees on provision of trained resources.

From Table 5.10 and Exhibit 5.5, it can be seen that 26.37% of the employees in ISO 9001:2000-certified organisations do not agree that trained resources are made available to meet the needs in their organisations as against 42.02% of employees in those which were not certified by ISO 9001:2000. It was also seen that in ISO 9001:2000-certified organisations, a comparatively high percentage of employees are undecided on this question. In order to check whether the pattern of responses from the two types of organisations is different, Chi square test was carried out. The computed Chi square value was 34.60 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference of means is significant or not, an independent sample t-test was carried out. The mean responses were computed; the values are 3.75 and 3.20 respectively for ISO 9001:2000-certified and organisations not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test was significant.

The ISO 9001:2000 certified organizations made trained resources available to meet the requisite needs.

In this context, it is relevant to find out whether there exist any association between the questions in the same group. Correlation matrix was analysed to find out this. Table 5.11 gives the values of correlation matrix for Top Management Commitment

**Table: 5.11**  
**Correlation matrix for Top Management Commitment**

Variables	Recognition and Appreciation for outstanding contributions	Warning for Commitment of errors by the employee	Establishment of quality objectives	Provision of Trained resources
Identification of product realisation processes	.280 (.000)	.025 (.233)	.149 (.000)	.168 (.000)
Recognition and Appreciation for outstanding contributions		.076 (.012)	.238 (.000)	.231 (.000)
Warning for Commitment of errors by the employee			.191 (.000)	.080 (.009)
Establishment of quality objectives				.205 (.000)

**Note: values given in the parentheses denote the p-value**

The Table shows that:

1. There is significant relation between 'Identification of product realisation processes' and 'Recognition and Appreciation for outstanding Contributions', 'Establishment of quality objectives' and 'Provision of Trained Resources' ( $p < .05$ ).
2. The relation between the 'Identification of product realisation processes' and 'Warning for commitment of errors by the employees is not significant ( $p > .05$ ).

Table 5.11 shows that the correlation coefficient is less than  $\pm .300$ , between all the attributes, which indicates that the strength of relation could be treated as low. Hence, the questions can be considered as independent factors. The mean score will be a measure of the level of existence of the attribute. The Mean scores for Top Management Commitment are calculated and tabulated in Table. 5.12.

**Table: 5.12**

**Mean scores for Top Management Commitment**

Status of certification	Identification of product realisation processes	Recognition and Appreciation for outstanding contributions	Warning for Commitment of errors by the employee	Establishment of quality objectives	Provision of Trained resources	Overall index of top management commitment
ISO 9001:2000 certified	3.38 (1.33)	3.70 (1.25)	3.76 (1.31)	3.41 (1.18)	3.75 (1.28)	3.60
Not certified by ISO 9001:2000	3.24 (1.26)	3.35 (1.42)	3.67 (1.28)	3.46 (1.36)	3.20 (1.34)	3.38
t- value (p- value)	1.628 (.104)	3.88 (0.001)	1.05 (0.146)	.473 (.637)	3.97 (0.000)	

**Note: values given in the parentheses denote the standard deviation**

1. From Table 5.12, it can be seen that there is no significant difference between ISO 9001:2000-certified organizations and those which are not certified by the standard ISO 9001:2000, as far as the attributes, identification of product realization processes, warning for commitment of errors by the employee and establishment of quality objectives are concerned. ( $p > .05$ )
2. In the case of the other two attributes, recognition and appreciation for outstanding contribution, and provision of trained resources, there is significant difference between the two types of organizations. ( $p < .05$ )

The hypothesis framed states that “Top Management Commitment is higher in ISO 9001:2000-certified organisations, compared to what is observed in those not certified to ISO 9001:2000 standards”. A t- test was done later, to ascertain whether the hypothesis could be accepted or not.

### **5.2.2. Analysis of Employee Involvement**

The presence of Employee Involvement gets reflected through attributes such as awareness and understanding of quality levels, willingness to participate in quality improvement programmes, etc. These can be shortlisted as:

- Establishment of individual and team objectives,
- Promotion of innovative efforts,
- Team effort for management of processes and evaluation of results, and
- Involvement in objective setting and decision making.

The involvement of employees is required to improve their willingness to own their contributions as well as mistakes. Questions 1, 2, 4, and 13 of the response sheet relate to this quality attribute. To examine the reliability of the responses received from the questions framed for this quality attribute, Cronbach’s alpha test was carried out. The value obtained was 0.74 and it indicated good reliability.

Involvement fosters team effort for managing processes. Innovation is the essence of management and it can be induced in an environment, where there is a good extent of involvement. Setting of objectives and decision making becomes easy in such an environment. Individual and team objectives are established in line with the mission of the organisation and these get reinforced when Employee Involvement becomes a reality.

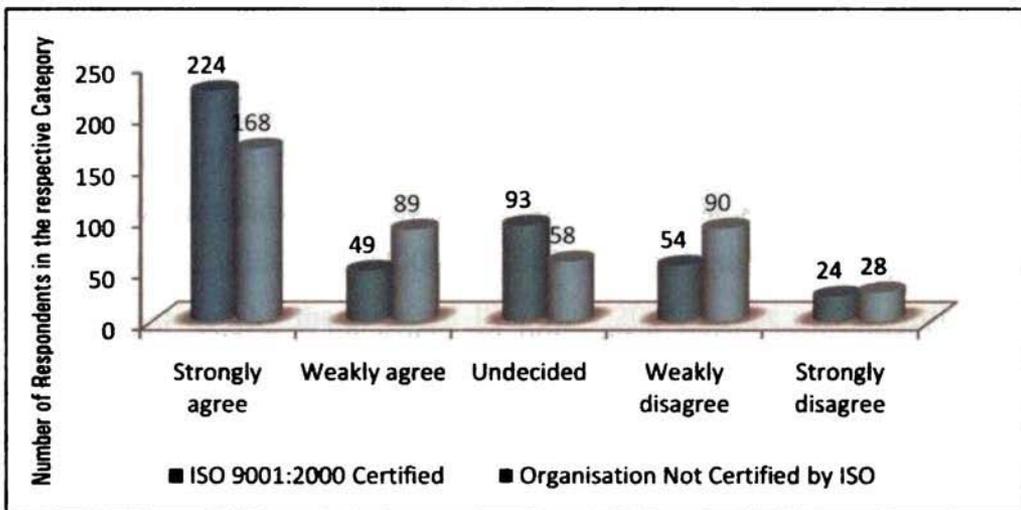
The response to question 1 addresses the first attribute, establishment of individual and team objectives: The responses to this question are given in Table 5.13. Its pictorial representation given in Exhibit 5.6.

**Table: 5.13 (Question 1)**  
**Distribution of responses from the employees on**  
**Establishment of individual and team objectives (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	224 (50.45)	49 (11.04)	93 (20.94)	54 (12.16)	24 (5.46)	444 (100)	4.20	1.30	.006
Not Certified by ISO 9001:2000	168 (38.79)	89 (20.56)	58 (13.39)	90 (20.79)	28 (6.47)	433 (100)	3.64	1.35	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.6 gives the Distribution of responses from the employees on establishment of individual and team objectives.



**Exhibit: 5.6** Distribution of responses from the employees on establishment of individual and team objectives.

As seen from Table 5.13 and Exhibit 5.6, 17.62% of the employees in ISO 9001:2000-certified organizations do not subscribe to the view that they are associated with the process of establishing individual and team objectives in their organisations, as against 27.26% employees in organisations not certified by ISO 9001:2000. It is also seen that in ISO 9001:2000-certified organisations, a comparatively high percentage of employees are undecided on this question. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 36.8 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference between the means is significant or not, an independent sample t-test was carried out.

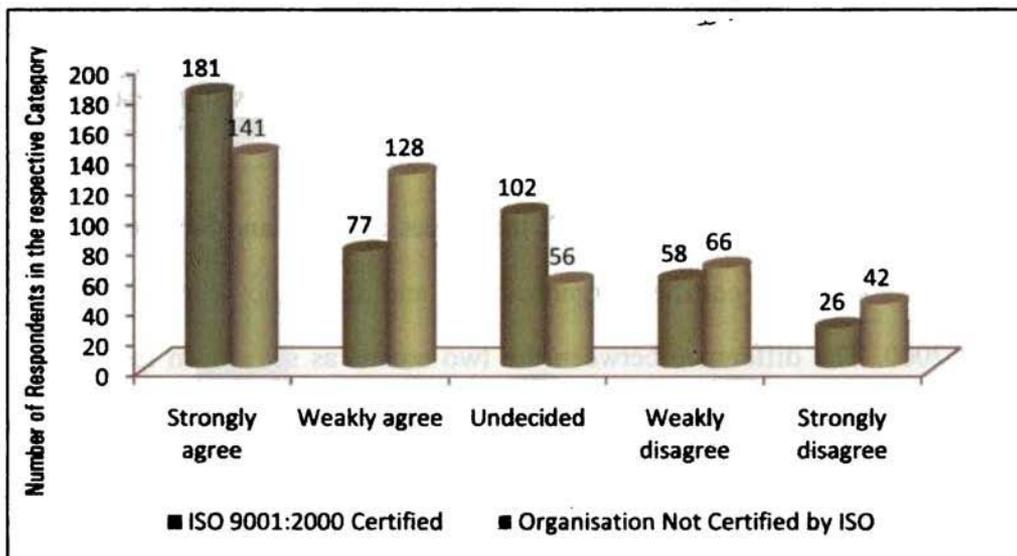
The mean responses were computed; the values are 4.20 and 3.64 respectively for ISO 9001:2000 certified organizations and those not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is significant, indicating that the employees in ISO 9001:2000-certified organisations are better associated with the establishment of individual and team objectives. The distribution of responses from the employees on promotion of innovative efforts and its pictorial representation are given in table 5.14 and Exhibit 5.7 respectively.

**Table: 5.14 (Question 2)**  
**Distribution of Responses from the Employees on Promotion of Innovative Efforts (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 sided)
ISO 9001:2000 Certified	181 (40.76)	77 (17.34)	102 (22.98)	58 (13.07)	26 (5.85)	444 (100)	3.74	1.27	.111
Not Certified by ISO 9001:2000	141 (32.56)	128 (29.57)	56 (12.93)	66 (15.25)	42 (9.69)	433 (100)	3.60	1.33	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.7 denotes the distribution of responses from the employees on promotion of innovative efforts.



**Exhibit: 5.7** Distribution of responses from the employees on promotion of innovative efforts.

Table 5.14 and Exhibit 5.7, indicate the fact that 18.92% of the employees in ISO 9001:2000-certified organizations do not agree that their

innovative efforts are encouraged in their organisations. As against this, 24.94% of the employees in organizations which are not certified by ISO 9001:2000 standards have the same view. 22.98 % of the respondents of ISO 9001:2000 certified organizations are undecided on this issue. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 35.2 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t- test was carried out.

The mean responses were computed; the values are 3.74 and 3.60 for ISO 9001:2000-certified organisations and those who not certified by ISO 9001:2000. The means of responses were computed and the difference between the two means is not significant, which indicates that innovative efforts are encouraged in both types of organisations in more or less the same way. This may be because of the fact that in organisations not certified by ISO 9001:2000 also, effort is made to instil the process of innovation, on account of the need to face severe competition in the market. Table 5.15 gives the distribution of responses from the employees on team effort for management of processes and evaluation of results and Exhibit 5.8 represents the same data pictorially.

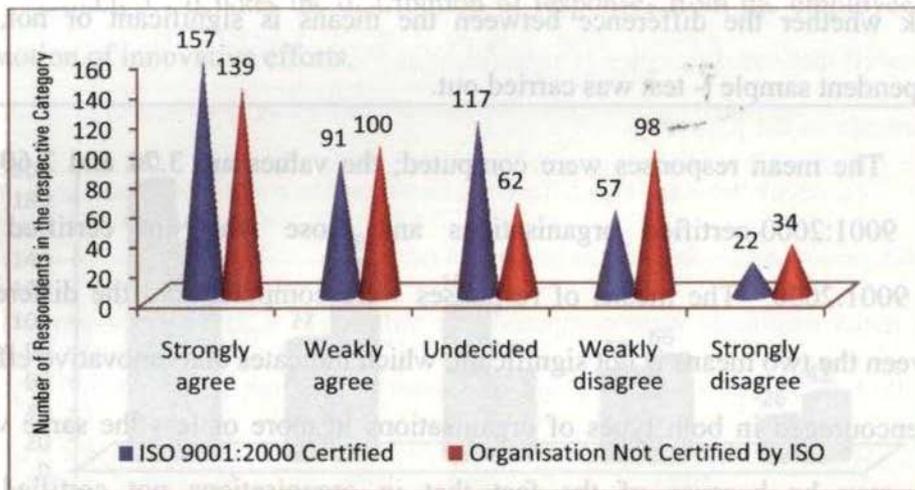
**Table: 5.15 (Question 4)**

**Distribution of responses from the employees on team effort for management of processes and evaluation of results (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	157 (35.36)	91 (20.49)	117 (26.36)	57 (12.84)	22 (4.95)	444 (100)	3.68	1.22	.025
Not Certified by ISO 9001:2000	139 (32.10)	100 (23.09)	62 (14.32)	98 (22.64)	34 (7.85)	433 (100)	3.48	1.34	

Note: The figures given in parentheses are the percentages of the responses.

The pictorial representation of data in Table 5.15 is given in Exhibit 5.8.



**Exhibit: 5.8** Distribution of responses from the employees on team effort for management of processes and evaluation of results.

As can be seen from Table 5.15 and Exhibit 5.8, 17.79% of the employees in ISO 9001:2000-certified organisations do not opine that they are a part of the team which manages process performance and evaluates the results. The percentage of employees in the organisations not certified by ISO 9001:2000 who have same view is 30.49%. It is also seen that in ISO 9001:2000-certified organisations there is comparatively a high percentage of employees who are undecided on this issue. In

order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 31.7 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t-test was carried out.

The mean responses are computed and the values are 3.68 and 3.48 respectively for ISO 9001:2000 certified and organisations not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is significant. This indicates that the practice of managing process performance and evaluation of results are not the same for the two types of organisations. The reason for this finding could be that ISO 9001:2000 organisations institute team building as a part of their culture, which ensures a higher level of involvement of employees in management of processes and evaluation of results. Distribution of responses from the employees' involvement in objective setting and decision making is given in table 5.16 and its pictorial representation in Exhibit 5.9.

**Table 5.16 (Question 13)**

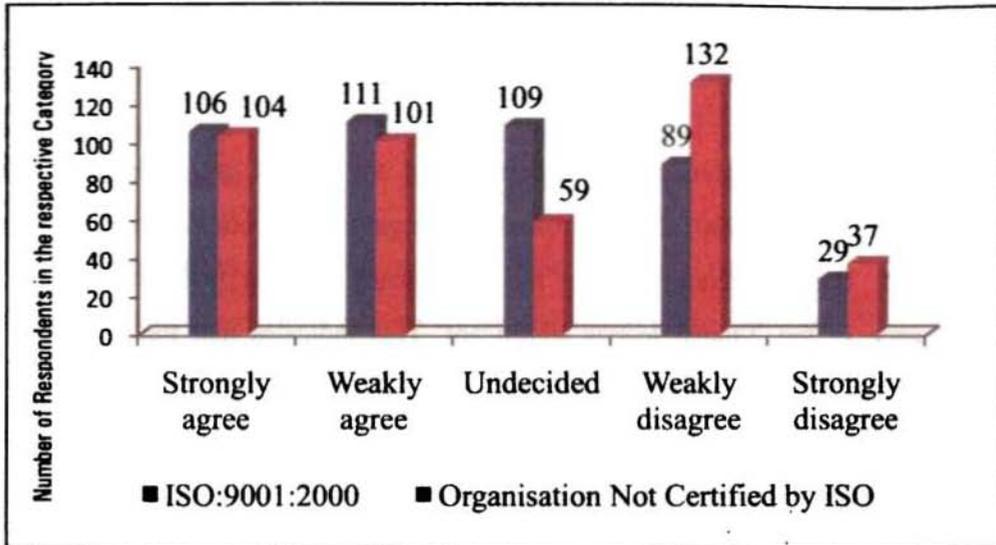
**Distribution of responses from the employees' involvement**

**In objective setting and decision making (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	106 (23.87)	111 (25.0)	109 (24.55)	89 (20.05)	29 (6.53)	444 (100)	4.02	1.31	.509
Not Certified by ISO 9001:2000	104 (24.01)	101 (23.33)	59 (13.63)	132 (30.48)	37 (8.54)	433 (100)	3.52	1.34	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.9 pictorially represents the data given in Table 5.16 (distribution of responses on the employees' involvement in objective setting and decision making.)



**Exhibit: 5.9** Distribution of responses on the employees' involvement in objective setting and decision making.

Table.5.16 and Exhibit 5.9 clearly demonstrate that 26.58% of the employees in ISO 9001:2000-certified organizations do not agree that all the members of their unit are involved in the process of objective setting and decision making. This value may be seen against the corresponding value of 39.02 % in organisations not certified by ISO 9001:2000 for the same attribute. The percentage of employees who is undecided on this issue works out to 24.55 and 13.63 respectively. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 14.41 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference is significant or not, an independent sample t-test was carried out. The mean responses are computed, the values are 4.02 and 3.52 respectively for ISO 9001:2000 certified organizations and those which are not certified. The difference between the two means as seen

from the value of significance in the 2-tailed test is not significant indicating that both types of organizations involve their employees in the process of setting objectives and making decisions in more or less the to the same extent. The existence of such good practices in organizations not certified to ISO 9001:2000 standards also would have led to this observation.

At this point of time, we would like to know whether there is any association between the questions in the same group. Correlation matrix is analysed to find out this and the respective values are given in Table 5.17.

**Table: 5.17**  
**Correlation matrix for Employee Involvement**

Variables	Promotion of innovative efforts	Team effort for management of processes and evaluation of results	Involvement in objective setting and decision making process
Establishment of individual and team objectives (Question No.1)	.323 (0.00)	.255 (0.00)	.286 (0.00)
Promotion of innovative efforts (Question No.2)		.376 (0.00)	.212 (0.00)
Team effort for management of processes and evaluation of results (Question No.4)			.329 (0.00)

*Note: Values given in the parentheses denote the p-value.*

Table 5.17 shows that the correlations between all the attributes of Employee Involvement are significant. Wherever the correlation coefficient is less than  $\pm .300$ , the strength of relation could be treated as low. In the present case, the value is above .300 only between establishment of individual and team objectives and promotion of innovative efforts, between promotion of innovative efforts, and team effort for management of processes and evaluation of efforts and between team effort and involvement in objective setting and decision making processes.

In the other cases of combinations, the correlation was found to be low. The presence of correlation indicated that the questions were not totally independent, which means that there might be underlying factors common to some of the questions. To identify these, factor analysis was carried out. Since the initially extracted factors could not be clearly identified, factor rotation was done and the resultant factor loadings are as follows. The factor loadings are given in the Table 5.18.

**Table: 5.18**  
**Rotation factor analysis – factor loadings**

<b>Questions</b>	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>
Q1	.135	.100	.952	.258
Q2	.081	.182	.264	.944
Q4	.158	.968	.097	.171
Q13	.977	.154	.126	.076
Percentage Variance	26.00	26.50	23.50	22

It can be seen from the Table 5.18 above that,

- Factor I (F1) is closely associated with Question 13 and its association with the other questions is weak. This factor can be named maturity in objective setting and decision making.
- Factor II (F2) is directly associated with Question 4 and its association with the other questions is weak. This factor represents performance management.
- Factor III (F3) has very strong association with Q1 and it does not have the same kind of association with the other questions. Establishment of objectives is the name suggested for this factor.

- Factor IV (F4) has close association with Q2 only and its association with other factors is weak. This factor can be named innovation initiative.

All the factors have more or less the same explained variance and each factor is mainly loaded with one question only. This means that each factor represents the corresponding questions. In other words, the questions themselves can be considered as factors. Table 5.19 gives an account of the Mean scores for Employee Involvement.

**Table: 5.19**  
**Mean scores for Employee Involvement**

Type	Maturity in objective setting and decision making (Factor 1)	Performance management (Factor 2)	Establishment of objectives (Factor 3)	Innovation initiative (Factor 4)	Overall index of employee involvement
ISO 9001:2000 certified	4.02 (1.29)	3.74 (1.27)	4.20 (1.21)	3.68 (1.32)	3.91
Not Certified by ISO 9001:2000	3.52 (1.35)	3.60 (1.33)	3.64 (1.34)	3.48 (1.34)	3.56
t-value	5.68	1.594	6.51	-.660	N/A
p-value	(0.000 )	(.111)	(0.000)	(.509)	

*Note: values given in the parentheses denote the standard deviation.*

It is seen from Table 5.19 that:

- There is no significant difference between the ISO 9001:2000-certified and the other type of organisations as far as performance management and innovation initiatives are concerned.

- As regards the factors, maturity in objective setting and decision making, as well as establishment of objectives, there is significant difference between the two types of organizations.

The hypothesis framed states that “ISO 9001:2000-certified organisations display a higher level of Employee Involvement in comparison to that seen in organisations which are not qualified to ISO 9001:2000 standards”.

A t-test was done to conclude whether the hypothesis could be accepted or not. The calculated t value is 3.95 and is greater than the table value of 1.97. As there is difference between the two types of organizations, the null hypothesis is rejected and the hypothesis under test is accepted.

### **5.2.3 Analysis of Team Working**

The initiative taken by the top management in team building will be clearly visible from the way of functioning of the employees. The attributes of the dimension ‘team working’ are:

- Pooling of expertise,
- Participation in process improvements,
- Cause and effect analysis, and
- Shared vision to take decisions.

The effectiveness of quality management also depends on the extent of team working, and close interpersonal relations increases its efficiency. Deming has stressed that barriers across the departments should be broken, if quality is to be improved. Question numbers 5, 10, 21 and 22 relate to the quality attribute of ‘team working’. To examine the reliability of the responses for this attribute, Cronbach’s alpha test was carried out. The value

was 0.77 and this indicates good reliability. Table 5.20 gives the details of responses in respect of pooling of expertise and this data is pictorially represented in Exhibit 5.10.

**Table: 5.20 (Question 5)**  
**Distribution of Responses from the employees on pooling of expertise (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	99 (22.29)	119 (26.81)	111 (25.00)	86 (19.37)	29 (6.53)	444 (100)	3.39	1.21	.280
Not Certified by ISO 9001:2000	128 (29.56)	120 (27.71)	56 (12.93)	91 (21.02)	38 (8.78)	433 (100)	3.48	1.33	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.10 gives the distribution of responses from the employees to pooling of expertise.



**Exhibit: 5.10** Distribution of responses from the employees to pooling of expertise.

From Table 5.20 and Exhibit 5.10, it is seen that 25.90% of the employees in ISO 9001:2000-certified organizations do not agree that pooling of expertise and resources help to tackle complex problems, as against 29.80% employees in organisations not certified by ISO 9001:2000. The percentage of employees who are undecided on this question is found comparatively high in ISO 9001:2000-certified organisations. The mean responses are computed; the values are 3.39 and 3.48 respectively for ISO 9001:2000-certified organisations and those which are not certified to this standard. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 23.03 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference of means is significant or not, an independent sample t-test was carried out. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant indicating that the employees in both types of organisations have more or less similar practices followed for pooling of expertise and resources. This could be due to the fact that organisations not certified by ISO 9001:2000 are catching up with their counterparts and are trying to demonstrate the impact of pooling of expertise in maintaining quality table 5.21 and Exhibit 5.11 give the data in numbers as well as pictorially respectively.

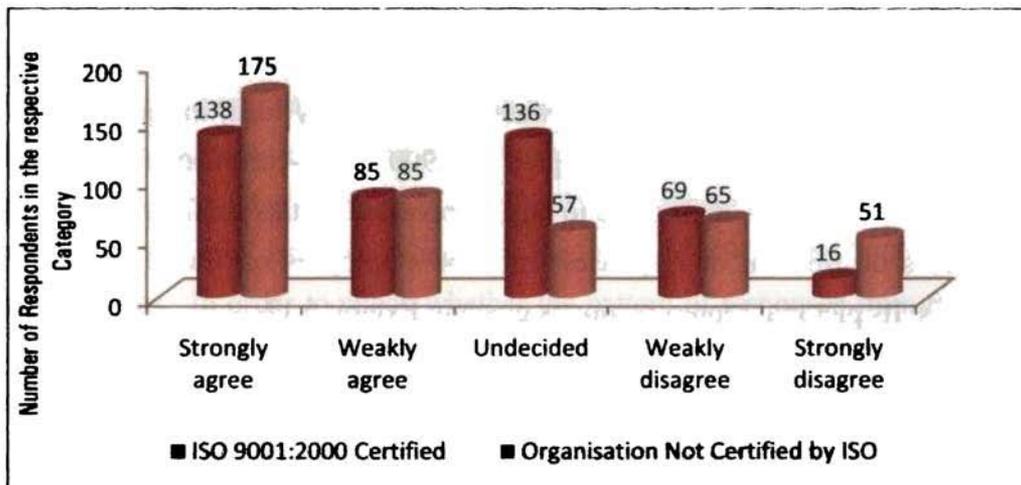
**Table: 5.21 (Question 10)**

**Distribution of responses from the employees on participation in process improvements (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	138 (31.08)	85 (19.14)	136 (30.63)	69 (15.55)	16 (3.60)	444 (100)	3.58	1.18	.707
Not Certified by ISO 9001:2000	175 (40.41)	85 (19.63)	57 (13.17)	65 (15.02)	51 (11.77)	433 (100)	3.61	1.43	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.11 gives an account of distribution of responses from the employees on participation in process improvements is given below.



**Exhibit: 5.11** Distribution of responses from the employees on participation in process improvements.

As can be seen from the Table 5.21 and Exhibit 5.11, 19.15% of the employees opined that they do not participate in the process improvements related to quality upgradation. The corresponding figure is 26.79% in the organisations not certified by ISO 9001:2000. The percentage of employees

who are undecided on this question is high in ISO 9001:2000-certified organisations.

The mean responses are computed; the values are 3.58 and 3.61 respectively for ISO 9001:2000-certified organisations and the other category. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 54.98 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

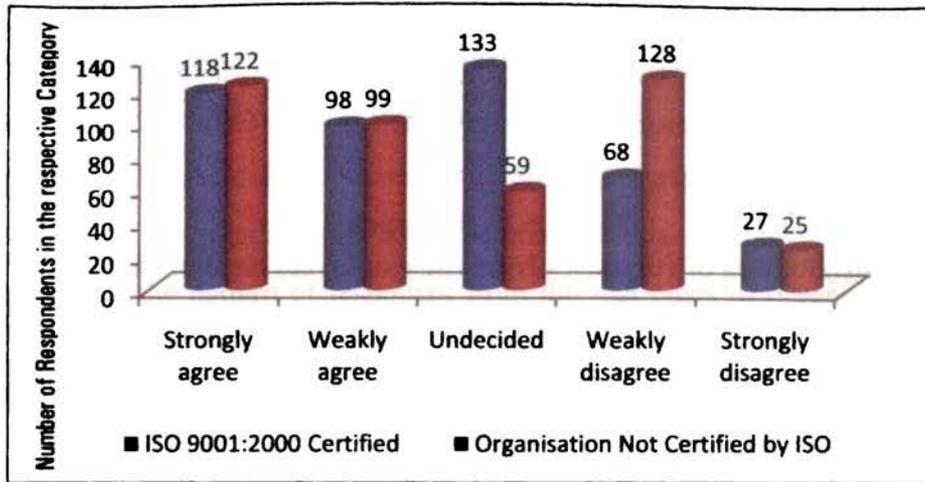
To check whether the difference between the means is significant or not, an independent sample t-test was carried out and the difference between the two means as seen from the value of significance in the 2-tailed test is not significant. This indicates that the extent of participation of the employees in process improvement related to quality up gradation is more or less the same in both types of organizations. Workers' participation in management and quality up gradation through improvement was a revolutionary idea, in the late 70's. organisations which have not attempted ISO 9001:2000-certification also seem to have given a lot of importance to this, as revealed by this finding. Table 5.22 describes distribution of responses from the employees on Cause and effect analysis. Its pictorial representation is given in Exhibit 5.12.

**Table 5.22 (Question 21)**  
**Distribution of responses from the employees on**  
**Cause and effect analysis (Data based on the survey)**

<b>Status of certification</b>	<b>Strongly agree</b>	<b>Weakly agree</b>	<b>Undecided</b>	<b>Weakly disagree</b>	<b>Strongly disagree</b>	<b>Total</b>	<b>Mean</b>	<b>SD</b>	<b>Sig (2 tailed)</b>
ISO 9001:2000 Certified	118 (26.58)	98 (22.07)	133 (29.96)	68 (15.31)	27 (6.08)	444 (100)	3.47	1.20	.259
Not Certified by ISO 9001:2000	122 (28.17)	99 (22.86)	59 (13.63)	128 (29.56)	25 (5.77)	433 (100)	3.38	1.31	

*Note: The figures given in parentheses are the percentages of the responses.*

Distribution of responses from the employees on cause and effect analysis is given in Exhibit 5.12



**Exhibit: 5.12** Distribution of responses from the employees on cause and effect analysis.

Table 5.22 and Exhibit 5.12 indicate that 21.39% of the employees in ISO 9001:2000-certified organizations do not subscribe to the view that there is a team to carry out cause and effect analysis. The corresponding value for the employees of the other category is 35.33%. The percentage of employees who is undecided on this issue is higher in the case of ISO 9001:2000-certified organisations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 46.90 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference is significant or not, an independent sample t- test was carried out. The mean responses are computed; the values are 3.47 and 3.38 respectively for ISO 9001: 2000-certified organizations and the ones not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant. It can be

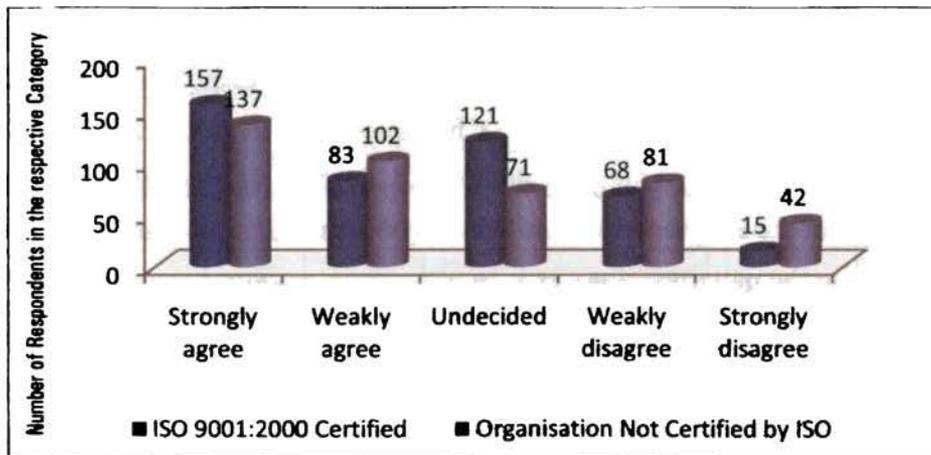
inferred that in both types of organizations team effort exists for solution of problems through cause and effect analysis in more or less the same way. It could be that organizations not certified by ISO 9001:2000 standards are also moving towards better quality management practices. Distribution of responses from the employees on shared vision is given in table 5.23 and Exhibit 5.13 represents pictorially.

**Table: 5.23 (Question 22)**  
**Distribution of responses from the employees on shared vision**  
*(Data based on the survey)*

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	157 (35.36)	83 (18.69)	121 (27.25)	68 (15.32)	15 (3.38)	444 (100)	3.67	1.99	.032
Not Certified by ISO 9001:2000	137 (31.63)	102 (23.56)	71 (16.39)	81 (18.73)	42 (9.69)	433 (100)	3.48	1.36	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.13 pictorially represents Distribution of responses from the employees on shared vision.



**Exhibit 5.13** Distribution of responses from the employees on shared vision.

The tabulated results in Table 5.23 and Exhibit 5.13, show that 18.70% of the employees in ISO 9001:2000-certified organisations do not agree to the proposition that shared vision guides to take decision on technical matters. The corresponding value in respect of the employees in organisations not certified by ISO 9001:2000 is 28.42%. A comparatively higher percentage of employees in ISO 9001:2000 organisations are undecided on this question. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 30.12 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference between the means is significant or not, independent sample t-test was carried out.

The mean responses were computed; the values are 3.67 and 3.48 respectively for ISO 9001:2000-certified organisations and those in the other category respectively. The difference between the two means as seen from the value of significance in the 2-tailed test is found significant. This indicates that there is difference between the two types of organizations as far as the role of shared vision is concerned in taking decision on technical matters. In ISO 9001:2000-certified organizations, shared vision and sharing of thoughts is given more importance.

Having looked at the response of the employees in both categories to all the attributes of team working, we would like to know whether there is any association between the questions in the same group. Correlation matrix is worked out and analysed to find out this. The Correlation matrix for Team Working is given in Table 5.24.

**Table: 5.24**  
**Correlation matrix for Team Working**

<b>Variables</b>	<b>Participation in process improvements</b>	<b>Cause and effect analysis</b>	<b>Shared vision to take decisions</b>
Pooling of expertise (Question No.5)	.201 (.000)	.021 (.266)	.151 (.000)
Participation in process improvements (Question No.10)		.258 (.000)	.308 (.000)
Cause and effect analysis (Question No.21)			.277 (.000)

*Note: values given in the parentheses denote the p- value.*

Table 5.24 shows that the relation between pooling of expertise and cause and effect analysis is not significant as p value is  $> .05$ , where as in all other cases the relation is significant. Wherever the correlation coefficient is less than  $\pm .300$ , the strength of relation could be treated as low. In the present case, the correlation is above .300 only between participation in process improvements and shared vision to take decisions. The presence of correlation indicates that the questions are not totally independent, which means that there might be underlying factors common to some of the questions. To identify these, factor analysis is carried out. Since the initially extracted factors could not be clearly identified, factor rotation was done and the resultant factor loadings are as follows. Table 5.25 gives an account of the factor loadings.

**Table: 5.25**  
**Rotation factor analysis- factor loadings**

<b>Questions</b>	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>
Q5	.001	.993	.067	.094
Q10	.122	.099	.173	.972
Q21	.985	.001	.129	.118
Q22	.133	.071	.973	.172
Percentage Variance	29.30	26.00	24.50	20.20

The findings are as follows:

Factor I (F1) I is closely associated with question 21 and its association with all other questions is weak. This factor can be named 'analysis through team effort'.

There is a close association for Factor II (F2) with question 5. It has no strong association with any other questions. The name 'problem solving through pooling of expertise' is suggested for this factor.

Factor III (F3) has close association with question 22 and its association with all other questions is not strong. This factor can be termed 'shared vision in technical decisions'.

Finally, Factor IV (F4) exhibits very close association to question 10 and it has no strong association with any other questions. This factor is named 'quality up gradation through quality improvements'. Explained variance is more or less the same for all the factors, and each factor is mainly loaded with only one question; so, the question itself can be considered as the factor. The values of the mean score is given in Table 5.26.

**Table: 5. 26**  
**Mean scores for team working**

Type of organization	Analysis through team effort (Factor 1)	Problem solving through pooling of expertise (Factor 2)	Shared vision in technical decision (Factor 3)	Quality up gradation through quality improvements (Factor 4)	Overall index of team working
ISO 9001:2000 certified	3.47 (1.21)	3.39 (1.18)	3.67 (1.20)	3.58 (1.20)	3.52
No ISO 9001:2000 certification	3.38 (1.33)	3.48 (1.43)	3.48 (1.31)	3.61 (1.36)	3.48
t-value	1.080	.376	1.103	-2.153	N/A
p-value	(.280)	(.707)	(.259)	(.032)	

*Note: values given in the parentheses denote the standard deviation.*

- There is no significant difference between ISO 9001:2000-certified organizations and those which are not certified, in respect of attributes analysis through team effort, problem solving through pooling of expertise, and shared vision in technical decisions. ( $p > .05$ )
- There is significant difference between the two types of organizations, as far as quality upgradation through quality improvements is concerned. ( $p > .05$ )

The hypothesis framed states that “Better Team Working exists in ISO 9001:2000-certified organizations compared to that in organizations not certified by ISO 9001:2000 standards”. A t- test was conducted to check whether the hypothesis could be accepted.

The calculated t- value is 0.46 and as it is less than the table value of 1.96, it could be inferred that there is no difference between the two types of organizations. So, and the null hypothesis is accepted and the hypothesis under test rejected.

#### **5.2.4 Analysis of Continual Improvement**

Continual Improvement is one of the pre-requisites of a quality management practice. Institutionalising improvement programmes give adequate opportunity for innovation. The attributes of Continual Improvement are:

- Enhancement of effectiveness and efficiency,
- Overview and validation of improvements,
- Balanced documentation, and
- Awareness of cost of quality.

Monitoring, measurement and control are processes prescribed as mandatory in ISO 9001:2000 standards. It is said that a stitch in time saves nine; so is the case with these processes too. Rejections and reworks can be considerably

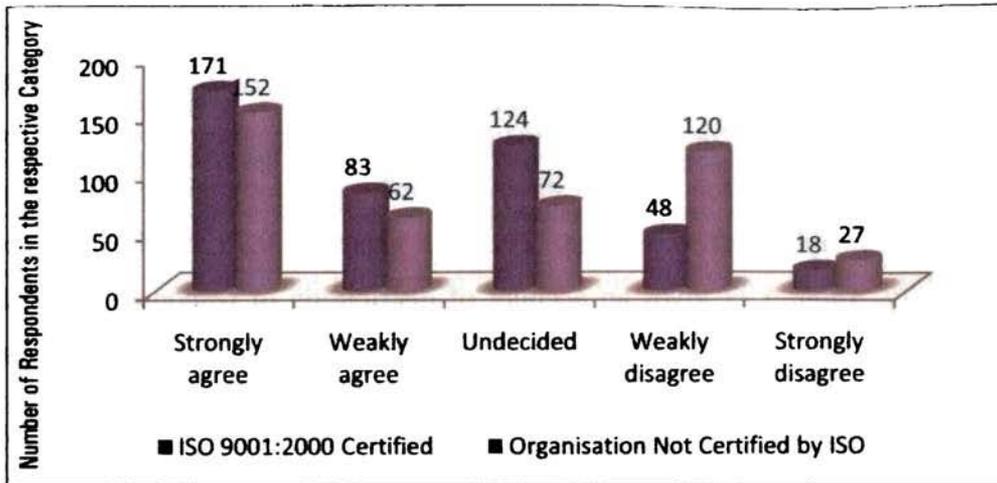
reduced, if these processes are adopted as a matter of routine. Here lies the importance of JIT (Just in Time). Question numbers 11, 12, 20 and 23 relate to the quality attribute: continual improvement. To examine the reliability of the responses received for the questions framed on continual improvement, Cronbach's alpha test was done. The test value of 0.79 confirmed good reliability. Table 5.27 gives an account of distribution of responses from the employees on Continual Improvement for enhancement of effectiveness and efficiency and it is represented pictorially in Exhibit 5.14

**Table: 5.27 (Question 11)**  
**Distribution of responses from the employees on**  
**Continual Improvement for enhancement of effectiveness**  
**and efficiency (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	171 (38.51)	83 (18.70)	124 (27.93)	48 (10.81)	18 (4.05)	444 (100)	3.76	1.18	.000
Not Certified by ISO 9001:2000	152 (35.11)	62 (14.32)	72 (16.63)	120 (27.71)	27 (6.23)	433 (100)	3.44	1.37	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.14 provides the information of the data given in Table 5.27 pictorially.



**Exhibit: 5.14** Distribution of responses from the employees on Continual Improvement for enhancement of effectiveness and efficiency.

It is observed from Table 5.27 and Exhibit 5.19 that 14.86% of the employees in ISO 9001:2000-certified organizations are not of the opinion that the processes of the organisation are continually improved to enhance effectiveness and efficiency, as against 33.94% employees in organisations not certified by ISO 9001:2000. The percentage of employees who is undecided on this issue is comparatively large in ISO 9001:2000-certified organisations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 50.48 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t-test was carried out. The mean responses are computed; the values are 3.76 and 3.44 respectively for ISO 9001:2000-certified organisations and those in the other category respectively. The difference between the two means as seen from the value of

significance in the 2-tailed test is significant, which indicates that there is a marked difference between the two types of organisations, as far as the Continual Improvement of the processes to enhance the effectiveness and efficiency is concerned.

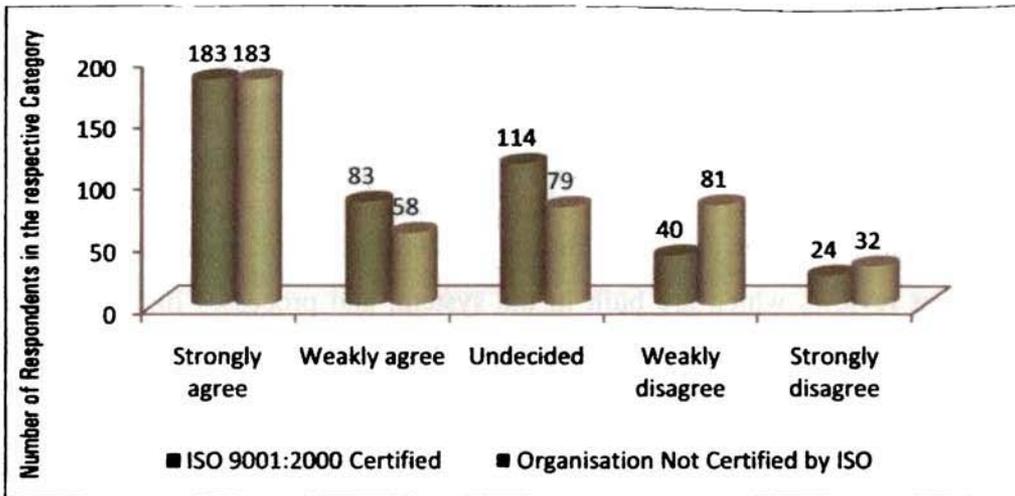
This could be because, ISO 9001:2000-certified organisations have frequent reviews which are built in the system, and processes like correction and corrective action are carried out on a real time mode and this is a mandatory clause of ISO 9001: 2000. In the case of organisations not certified by ISO 9001:2000, there is a chance for defects to be noticed only when the final product is turned out. Table 5.28 provides information on the responses in respect of overview and validation of improvements and this data is presented pictorially in Exhibit 5.15.

**Table: 5. 28 (Question 12)**  
**Distribution of responses from employees on overview and validation of improvements (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	183 (41.22)	83 (18.69)	114 (25.68)	40 (9.10)	24 (5.40)	444 (100)	3.81	1.21	.055
Not Certified by ISO 9001:2000	183 (42.27)	58 (13.39)	79 (18.25)	81 (18.70)	32 (7.39)	433 (100)	3.64	1.38	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.15 represents pictorially the data presented in table 5.28 (distribution of responses from employees on overview and validation of improvements)



**Exhibit: 5.15** Distribution of responses from employees on overview and validation of improvements.

As can be seen from Table 5.28 and Exhibit 5.15, 14.50% of the employees in ISO 9001:2000-certified organizations, do not subscribe to the view that the improvements overviewed and validated. The corresponding strength in respect of the employees from organizations which are not certified is 26.09%. The score of employees who are undecided on this question is high in ISO 9001:2000-certified organisations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 25.68 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t- test was carried out. The mean responses are computed; and the values are 3.81 and 3.64 respectively for ISO 9001:2000-certified organisations and those in organisations not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant, which indicates that there is no difference between the two types of organizations, as far as the overview and validation of improvement is

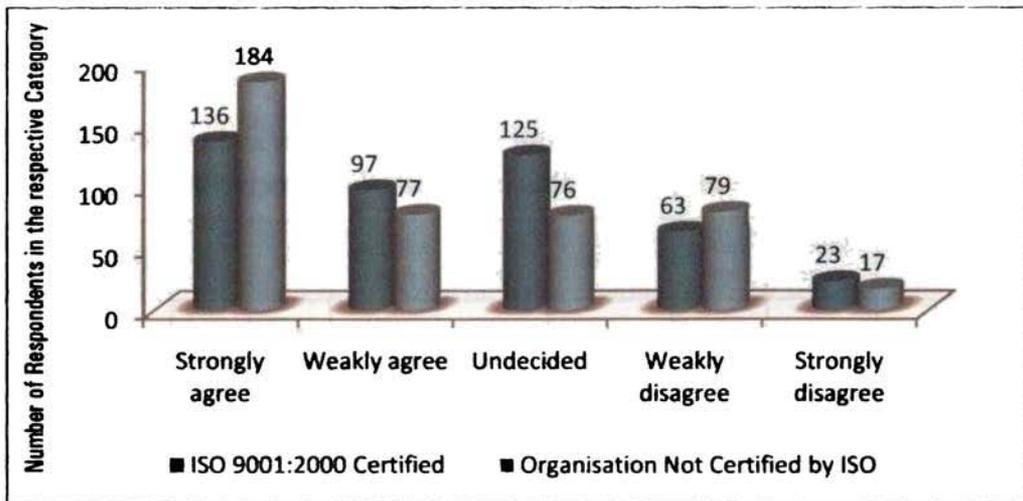
concerned. Nowadays organisations, whether certified for quality or not, cannot compromise on some efforts for quality improvement and this could be the reason for this finding. Distribution of responses from the employees on balanced documentation is presented in table 5.29 and its pictorial representation in Exhibit 5.16.

**Table: 5.29 (Question 20)**  
**Distribution of responses from the employees on**  
**balanced documentation (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	136 (30.63)	97 (21.85)	125 (28.15)	63 (14.19)	23 (5.18)	444 (100)	3.96	1.20	.031
Not Certified by ISO 9001:2000	184 (42.49)	77 (17.78)	76 (17.55)	79 (18.25)	17 (3.93)	433 (100)	3.76	1.28	

**Note:** The figures given in parentheses are the percentages of the responses.

The distribution of responses from the employees on balanced documentation is represented Exhibit 5.16.



**Exhibit: 5.16** Distribution of responses from the employees on balanced documentation.

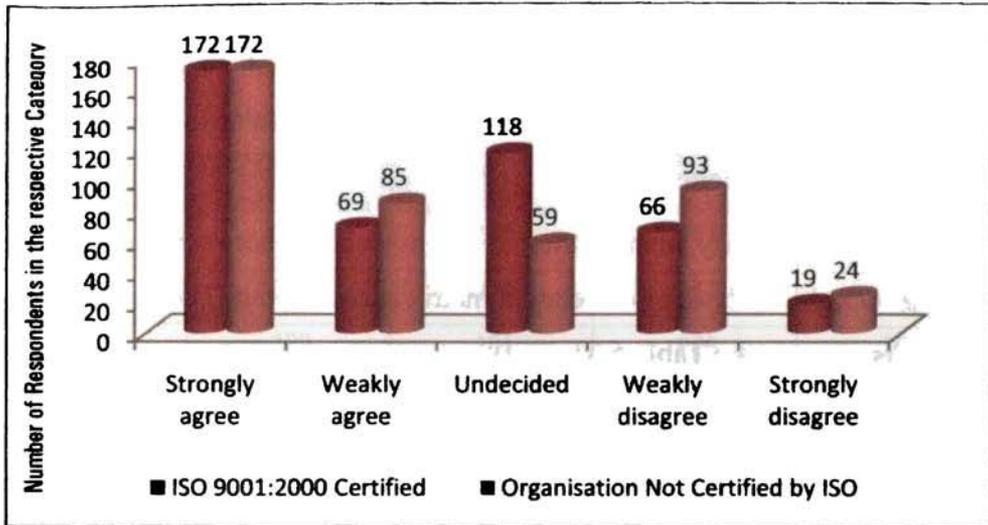
From Table 5.29 and Exhibit 5.16 it is noted that 19.37% of the employees in ISO 9001:2000-certified organizations do not agree that improvements and failures are systematically documented with the same vigour. The employees from organisations not certified by ISO 9001:2000 gave their rating as 22.18%. The percentage of employees who are undecided on this issue is high ISO 9001:2000-certified organisations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 26.36 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t-test was carried out. The mean responses are computed; and the values are 3.96 and 3.76 respectively. The difference between the two means as seen from the value of significance in the 2-tailed test is significant. ISO 9001:2000-certified organizations take a lot of effort in systematising the documentation necessary to ensure that the improvement efforts are in the right direction. Table 5.30 and Exhibit 5.17 represent the data in respect of the response on awareness of cost of quality in figures and pictorially respectively.

**Table: 5.30 (Question 23)**  
**Distribution of responses from the employees on awareness of**  
**cost of quality (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	172 (38.73)	69 (15.55)	118 (26.58)	66 (14.86)	19 (4.28)	444 (100)	3.99	1.24	.723
Not Certified by ISO 9001:2000	172 (39.72)	85 (19.63)	59 (13.63)	93 (21.47)	24 (5.55)	433 (100)	3.66	1.33	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.17 displays the distribution of responses from the employees to awareness on cost of quality, in a pictorial way.



**Exhibit: 5.17** Distribution of responses from the employees to awareness on cost of quality.

Observations from Table 5.30 and Exhibit 5.17 demonstrate that 19.14% of the employees of ISO 9001:2000-certified organizations reported that they are not aware of the cost of quality.

In the case of employees of the other category of organisations the percentage is 27.02%. The score for “undecided” is high among the employees of ISO 9001:2000-certified organizations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 26.36 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. An independent sample t- test was carried out, to check whether the difference between the means is significant or not. The mean responses are computed; and the values are 3.99 and 3.66 respectively for QMS compliant organizations and those not certified

by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant. The result of the test indicates that awareness of cost of quality is the same in both categories of organisations. It could be that organizations not certified by ISO 9001:2000 standards also have become conscious of cost of quality so as to enable them to face the competition better.

In order to verify whether there is any association between the questions in this group, the analysis of correlation matrix is carried out. The correlation analysis is given in the Table 5.31.

**Table: 5.31**  
**Correlation matrix for continual improvement**

<b>Variables</b>	<b>Overview and validate improvements</b>	<b>Balanced documentation</b>	<b>Awareness of cost of quality</b>
Enhancement of effectiveness and efficiency (Question No11).	.322 (.000)	.330 (.000)	.320 (.000)
Overview and validate improvements(Question No12).		.341 (.000)	.153 (.000)
Balanced documentation (Question No20).			.292 (.000)

*Note: values given in the parentheses denote the p- value.*

Table 5.31 shows that the correlation among all the factors is significant. ( $p < .05$  in all cases). Wherever the correlation coefficient is less than  $\pm .300$ , the strength of relation could be treated as low. In the present case, the correlation stood below .300 only, between awareness of cost of quality and overview of validation of improvements and between balanced documentation. The presence of correlation indicates that the questions are not totally independent, which means that there might be underlying factors common to some of the questions. To identify these, factor analysis is carried out. Since the

initially extracted factors could not be clearly identified, factor rotation was done and the resultant factor loadings are as follows. The factor loadings are given in Table 5.32.

**Table: 5.32**  
**Rotation factor analysis – factor loadings**

Questions	F1	F2	F3	F4
Q11	.233	.171	.169	.942
Q12	.051	.974	.157	.156
Q20	.129	.161	.965	.159
Q23	.966	.051	.129	.217
Percentage Variance	29.00	28.00	22.00	21.00

It can be noted from the factor loadings that:

Factor I (F1) has very close association with question 23 and it does not have any association with any other questions. ‘Awareness of quality costs’ is suggested as the name for this factor.

There is close association for Factor II (F2) with question 12. The association of this factor with the entire other questions is weak. This may be named ‘Review mechanism for improvements’.

Factor III (F3) is closely associated with question 20 and it has very close association with all other questions. This factor is assigned the name ‘Balanced documentation’.

There is close association for Factor IV (F4) with question 11. The association of this factor with the entire other questions is weak. This factor is named ‘Awareness of enhancement of effectiveness and efficiency’.

All the four factors have more or less the same explained variance and each factor is mainly loaded with one question. This means that each factor will represent the corresponding questions, and so the questions themselves can be considered as factors. The Mean Scores for Continual Improvement are given in Table 5.33.

**Table: 5. 33**  
**Mean Scores for Continual Improvement**

Type of organization	Awareness of quality cost (Factor 1)	Review mechanism for improvements (Factor 2)	Balanced documentation (Factor 3)	Awareness of enhancement of effectiveness and efficiency (Factor 4)	Overall index of continual improvement
ISO 9001:2000 certified	3.99 (1.19)	3.81 (1.22)	3.96 (1.20)	3.76 (1.24)	3.88
Not certified by ISO 9001:2000	3.66 (1.37)	3.64 (1.38)	3.76 (1.28)	3.44 (1.33)	3.62
t-value	3.83	1.923	2.40	.354	N/A
p-value	(0.000)	(.055)	(0.008)	(.723)	

*Note: Values given in the parentheses denote the standard deviation.*

It is seen from Table 5.33 that:

- There is no difference between ISO 9001:2000-certified and the other category of organisations as far as review mechanism for improvements and awareness of enhancement of effectiveness and efficiency is concerned. ( $p > .05$ )
- There is significant difference between the two types of organisations as far as awareness of quality cost and balanced documentation is concerned. ( $p < .05$ )

The hypothesis framed states that "ISO 9001:2000-certified organizations practise Continual Improvement more meticulously in comparison to those which are not ISO 9001:2000-certified". In order to decide whether the hypothesis can be accepted or not, a t- test was carried out. The calculated t value works out to 3.00 which is greater than the table value of 1.97. This indicates that there is difference between the two types of organisations, and hence the null hypothesis is rejected and the hypothesis under test accepted.

## **5.2 .5 Analysis of Internal Communication**

Communication plays a critical role in quality management. No doubt, transparency will contribute to the overall growth of the organisation. Internal communication has the following attributes:

- Self-improvement,
- Communication of feedback on obstacles faced,
- Communication of importance of quality management system, and
- Communication of objectives and accomplishments.

In order to make the self-improvement programme effective, meaningful dialogue should take place among small groups. This has also to be positive, healthy and proactive. Dialogues can become sound only if freedom of communication really exists. Feedback communication and allround communication of objectives and accomplishments will make the organisation vibrant.

The quality attributes of internal communication are represented by question numbers 9, 18, 19 and 25. To examine the reliability of the responses received for the questions related to this quality attribute, Cronbach's alpha test was conducted. The test result obtained was 0.81 and this indicated good

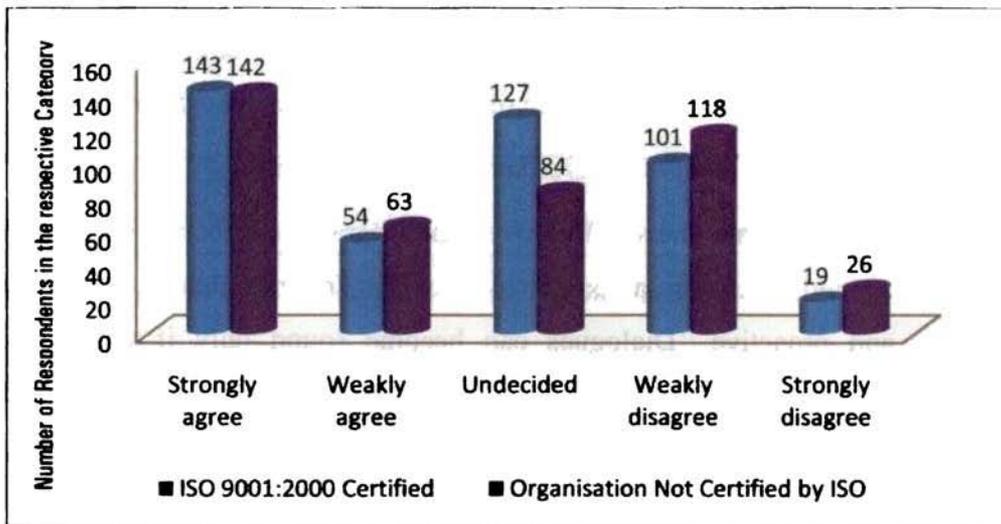
reliability. The Table 5.34 and its corresponding pictorial representation, Exhibit 5.17 are given below.

**Table: 5.34 (Question 9)**  
**Distribution of responses from the employees on self-improvement programme (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	143 (32.20)	54 (12.16)	127 (28.6)	101 (22.76)	19 (4.28)	444 (100)	3.45	1.27	0.105
Not Certified by ISO 9001:2000	142 (32.80)	63 (14.55)	84 (19.40)	118 (27.25)	26 (6.00)	433 (100)	3.40	1.34	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.17 represents distribution of responses from the employees on self improvement programme the data in table 5.34 pictorially.



**Exhibit: 5.18** Distribution of responses from the employees on self improvement programme.

It is noted from Table 5.34 and Exhibit 5.18 that 27.04% of the employees of ISO 9001:2000-certified organizations do not agree to the point that there is a self-improvement programme in their department whereas the corresponding score for the organizations not certified by ISO 9001:2000 is 33.25%. The percentage of employees undecided on this issue is high in the case of ISO 9001:2000-certified organizations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 11.73 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference between the means is significant or not, an independent sample t-test was carried out.

The mean responses were computed; and the values are 3.45 and 3.40 respectively for ISO 9001:2000-certified organizations and the other category. The difference between the means, as seen from the value of significance in the 2-tailed test is not significant which indicates that self-improvement programme for various categories of employees is more or less the same in both types of organizations. The reason for such an occurrence may be that the organisations not certified by ISO 9001:2000 are catching up with the ISO 9001:2000 certified organizations, as far as improvement of processes or products is concerned. Table 3.15 represents the Distribution of responses from the employees on communication of feedback on obstacles faced. Same data is pictorially represented in the Exhibit 5.19.

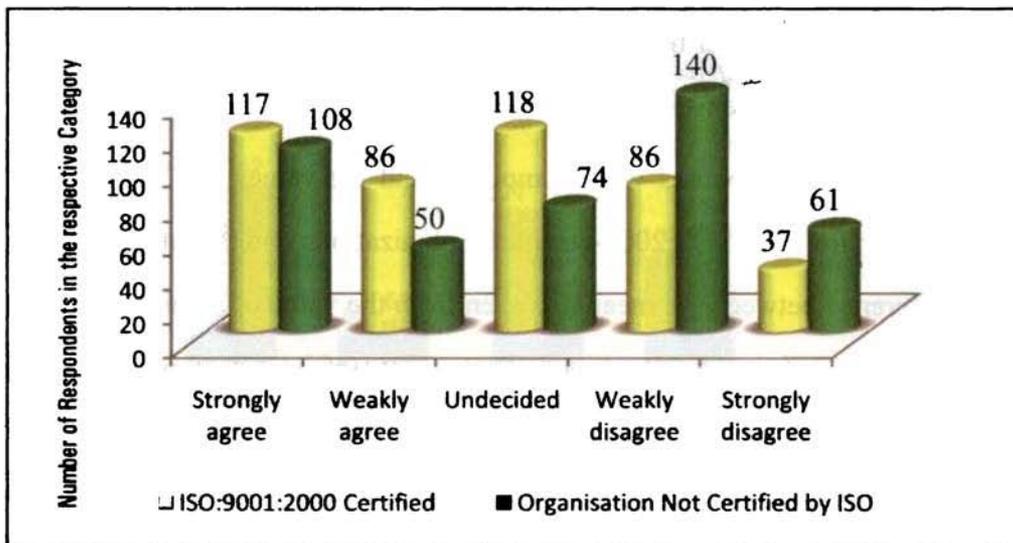
**Table: 5.35 (Question18)**

**Distribution of responses from the employees on communication of feedback on obstacles faced (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	117 (26.36)	86 (19.37)	118 (26.57)	86 (19.37)	37 (8.33)	444 (100)	3.36	1.28	0.000
Not Certified by ISO 9001:2000	108 (24.94)	50 (11.55)	74 (17.09)	140 (32.34)	61 (14.08)	433 (100)	3.00	1.41	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.19 gives the Distribution of responses from the employees on communication of feedback on obstacles faced.



**Exhibit 5.19** Distribution of responses from the employees on communication of feedback on obstacles faced.

From Table 5.35, Exhibit 5.24, it is evident that 27.70% of the employees in ISO 9001:2000-certified organizations held the opinion that they are not encouraged to communicate the feedback on obstacles faced in achieving improvement goals. The corresponding value in the other category is

46.42%. The percentage of respondents undecided on this question is very high in ISO 9001:2000-certified organization. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 38.60 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t-test was carried out.

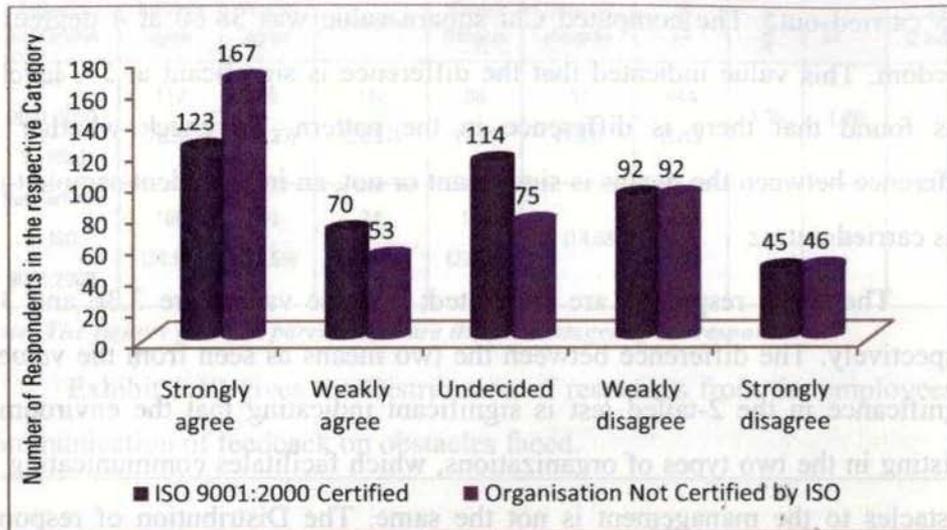
The mean responses are computed; and the values are 3.36 and 3.00 respectively. The difference between the two means as seen from the value of significance in the 2-tailed test is significant indicating that the environment existing in the two types of organizations, which facilitates communicating the obstacles to the management is not the same. The Distribution of responses from the employees on effectiveness of quality management system across the organization is given in Table 5.36. It is represented pictorially in Exhibit 5.20.

**Table: 5.36 (Question 19)**  
**Distribution of responses from the employees on effectiveness of**  
**quality management system across the organization**  
*(Data based on the survey)*

<b>Status of certification</b>	<b>Strongly agree</b>	<b>Weakly agree</b>	<b>Undecided</b>	<b>Weakly disagree</b>	<b>Strongly disagree</b>	<b>Total</b>	<b>Mean</b>	<b>SD</b>	<b>Sig (2 tailed)</b>
ISO 9001:2000 Certified	123 (27.70)	70 (15.76)	114 (25.67)	92 (20.73)	45 (10.14)	444 (100)	3.30	1.34	.151
Not Certified by ISO 9001:2000	167 (38.56)	53 (12.24)	75 (17.32)	92 (21.25)	46 (10.63)	433 (100)	3.46	1.44	

*Note: The figures given in parentheses are the percentages of the responses.*

Distribution of responses from the employees on effectiveness of quality management system across the organization is provided in a pictorial way in Exhibit 5.20.



**Exhibit: 5.20** Distribution of responses from the employees on effectiveness of quality management system across the organization.

It can be observed from Table 5.36 and Exhibit 5.20, that 30.87% of the employees of organisations not certified by ISO 9001:2000 do not subscribe to the view that the effectiveness of quality management system is communicated across the organisation. The value in respect of the other categories is almost the same, 31.88%. However, the percentage of employees undecided on this issue is comparatively high in ISO 9001:2000-certified organizations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 16.94 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

An independent sample t-test was carried out to find out whether the difference between the means is significant or not. The mean responses are computed; and the values are 3.30 and 3.46 respectively for ISO 9001:2000-certified and the other category. The difference between the

two means, as seen from the value of significance in the 2-tailed test is not significant indicating that communication on the effectiveness of quality management system across the organisation is more or less the same. Table 5.37 gives an account of distribution of responses from the employees on communication of objectives and accomplishments. Distribution of responses from the employees on communication of objectives and accomplishments is given Table 5.37 and its pictorial representation given in Exhibit 5.21.

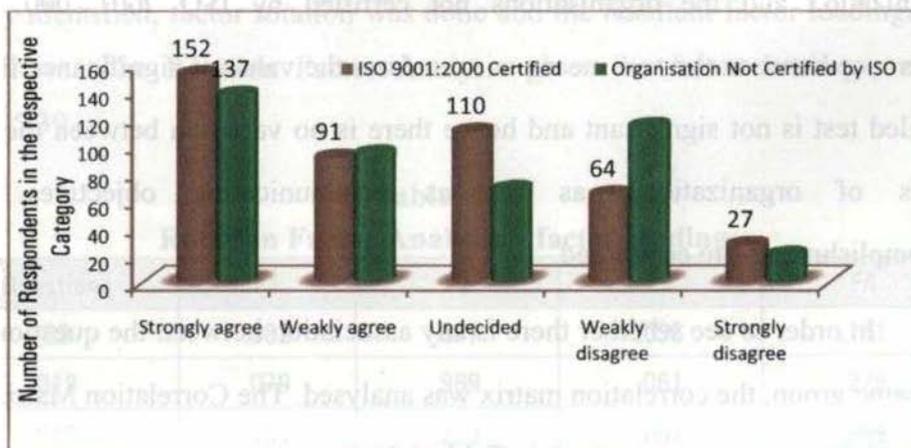
**Table: 5.37 (Question 25)**

**Distribution of responses from the employees on communication of objectives and accomplishments (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	152 (34.23)	91 (20.49)	110 (24.78)	64 (14.42)	27 (6.08)	444 (100)	3.51	1.26	.202
Not Certified by ISO 9001:2000	137 (31.63)	94 (21.71)	68 (15.70)	114 (26.33)	20 (4.63)	433 (100)	3.49	1.30	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.21 gives details of distribution of responses from the employees on communication of objectives and accomplishments, pictorially



**Exhibit: 5.21** Distribution of responses from the employees on communication of objectives and accomplishments.

Table 5.37 and Exhibit 5.26 indicate that 20.50% of the employees of the ISO 9001:2000 certified organizations do not agree that there exists an effective and efficient process of communicating objectives and accomplishments. The corresponding figure in the category of organisations without ISO 9001:2000 is 30.96%. The percentage of employees undecided on this issue is comparatively high in ISO 9001:2000-certified organizations. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 25.69 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

An independent sample t-test was carried out, to find out whether the difference between the means is significant or not. The mean responses are computed; and the values 3.51 and 3.49 respectively in ISO 9001:2000-certified organization and the organisations not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant and hence there is no variation between the two types of organizations, as far as communicating objectives and accomplishments are concerned.

In order to see whether there is any association between the questions in the same group, the correlation matrix was analysed. The Correlation Matrix for Internal Communication is given in Table 5.38.

**Table: 5.38****Correlation Matrix for Internal Communication**

<b>Variables</b>	<b>Communicate feedback on obstacles</b>	<b>Effectiveness of quality management system across the organization</b>	<b>Communicate objectives and accomplishments</b>
Self Improvement (Question No.9)	.190 (.000)	.307 (.000)	.200 (.000)
Communicate feedback on obstacles (Question No.18)		.317 (.000)	.139 (.000)
Effectiveness of QMS across the organization (Question No.19)			.153 (.000)

*Note: Values given in the parentheses denote the p- value.*

It is seen from Table 5.38 that the correlation among all the factors is significant. ( $p < .05$  in all cases). In the cases where the correlation is less than  $\pm .300$ , the strength of correlation could be treated as low. In the present case, the correlation across all the other attributes is low. The presence of correlation indicates that the questions are not totally independent, which means that there may be underlying factors common to some of the questions. To identify these, factor analysis is carried out. Since the initially extracted factors could not be clearly identified, factor rotation was done and the resultant factor loadings are as follows. The Rotation Factor Analysis gives the factor loadings, as in Table 5.39.

**Table: 5.39****Rotation Factor Analysis – factor loadings**

<b>Questions</b>	<b>F1</b>	<b>F2</b>	<b>F3</b>	<b>F4</b>
Q9	.982	.077	.096	.141
Q18	.079	.969	.061	.225
Q19	.151	.223	.067	.959
Q25	.093	.058	.992	.062
Percentage variance	29.80	27.20	23.50	19.50

**The following points are inferred from the above:**

Factor I (F1) is closely associated with question 9 and it has no association with any other questions. This factor can be named ‘Self-improvement’.

Factor II (F2) has strong association with question 18; its association with all other questions is weak. ‘Freedom to communicate the obstacles faced’ is the name suggested for this factor.

Factor III (F3) is closely associated with question 25 and it has weak association with all the other questions. This factor is named ‘Efficiency in communicating objectives and accomplishments’.

Factor IV (F4) is found to have close association with question 19 and has no strong close association with any other question. ‘Transparency in effectiveness of quality management system’ is the name suggested for this factor.

All the factors are found to have more or less the same explained variance and each factor is mainly loaded with one question. This means that each factor represent the corresponding questions and so the questions themselves could be considered as the factors. The Mean Scores for internal communication is given in Table 5.40.

**Table: 5.40**  
**Mean Scores for Internal Communication**

Type of organization	Self improvement (Factor 1)	Freedom to communicate the obstacles faced (Factor 2)	Efficiency in communicating objectives and accomplishments (Factor 3)	Transparency in effectiveness of quality management system (Factor 4)	Overall index of Internal Communication
ISO 9001:2000 certified	3.45 (1.27)	3.36 (1.28)	3.51 (1.34)	3.30 (1.26)	3.40
Not Certified by ISO 9001:2000	3.40 (1.34)	3.00 (1.41)	3.49 (1.44)	3.46 (1.30)	3.33
t-value	.498	3.849	1.777	-1.502	
p-value	(.026)	(.016)	(.000)	(.055)	

*Note: values given in the parentheses denotes the standard deviation.*

The difference between the two types of organisations is found to be not significant in the case of the attribute, transparency in effectiveness of quality management system only. ( $p > .05$ ) The difference is significant, in the case of all the other three factors, viz., self-improvement, freedom to communicate the obstacles faced, and efficiency in communicating objectives and accomplishments.

The hypothesis framed states that “ISO 9001:2000-certified organizations put higher thrust on internal communication compared to those which are not ISO 9001:2000 certified”. In order to check whether the hypothesis could be accepted, a t- test was conducted. The calculated t-value is 0.77 and as it is lower than the table value of 1.97 it could be concluded that there is no difference between the two types of organizations. Hence the null hypothesis is accepted and the hypothesis under test rejected.

### **5.2.6 Analysis of Customer Satisfaction**

The customer holds the key for the growth of any organisation. The present and future needs as well as direct and implied needs of the customer have to be addressed on a real time mode. The attributes of this dimension can be shortlisted as follows.

- Knowledge of customer complaints,
- Knowledge of current and future needs of the customer,
- Listening to customers’ voice, and
- Monitoring and measuring customer feedback.

The quality of a product manufactured or a service rendered is the pride of any employee and the organisation, and this cannot be attained without a clear

understanding of the level of acceptance or rejection of the product. If the rejection or the rework levels are made known to the employees, the management can involve them in the process of correction proactively.

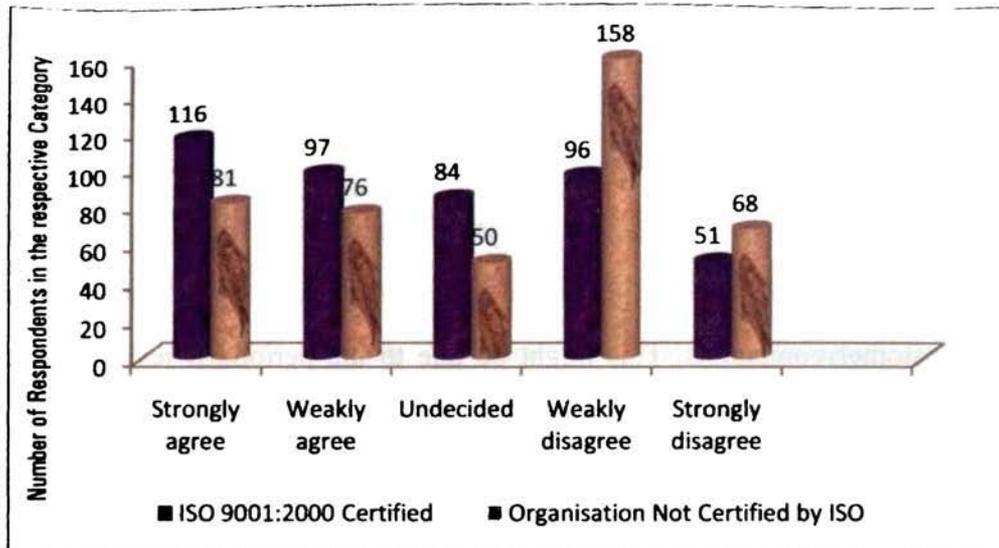
Question numbers 3, 15, 16 and 17 of the questionnaire denote the quality attributes of Customer Satisfaction. To examine the reliability of the responses received for these questions, Cronbach's alpha test was conducted. The test result was 0.71 and this indicated good reliability. These questions are related to the awareness of customer complaints, needs of the customers, listening to customers' voice and mechanism of feedback measurement. The data from these provide an insight into the levels of Customer Satisfaction existing in both categories of organizations. Table 5.41 gives an account of the distribution of responses of employees on knowledge of customer complaints. The same data is pictorially given in Exhibit 5.22.

**Table: 5.41 (Question 3)**  
**Distribution of responses of employees on knowledge of customer complaints (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tail)
ISO 9001:2000 Certified	116 (26.13)	97 (21.84)	84 (18.92)	96 (21.63)	51 (11.48)	444 (100)	3.30	1.36	.000
Not Certified by ISO 9001:2000	81 (18.70)	76 (17.56)	50 (11.55)	158 (36.48)	68 (15.71)	433 (100)	2.87	1.38	

**Note: The figures given in parentheses are the percentages of the responses.**

Exhibit 5.22 provides a pictorial representation of the Distribution of responses of employees to knowledge of customer complaints.



**Exhibit: 5.22** Distribution of responses of employees to knowledge of customer complaints.

From Table 5.41 and Exhibit 5.22, it is clear that 33.11% of the employees in ISO 9001:2000-certified organizations do not know the current level of customer complaints. The score in the case of employees of organizations without ISO 9001:2000-certification is 52.19%. It is also observed that ISO 9001:2000-certified organisations have a high percentage of employees who are undecided on this question. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 34.82 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern. To check whether the difference between the means is significant or not, an independent sample t-test was carried out. To check whether the difference between the means is significant or not, an independent sample t-test was carried out.

The mean responses are computed; the values are 3.30 and 2.87 respectively for ISO 9001:2000-certified organisations and those not certified by ISO 9001:2000. The difference between the two means, as seen from the value of significance in the 2-tailed test, is significant, which indicates that employees in ISO 9001:2000-certified organizations have better knowledge of the customer complaints. This might be due to the periodical reviews which take place as a part of ISO 9001:2000 implementation and beyond. Distribution of responses from the employees on knowledge of current and future needs of the customer is given in Table 5.42. Its corresponding pictorial representation is given in Exhibit 5.23.

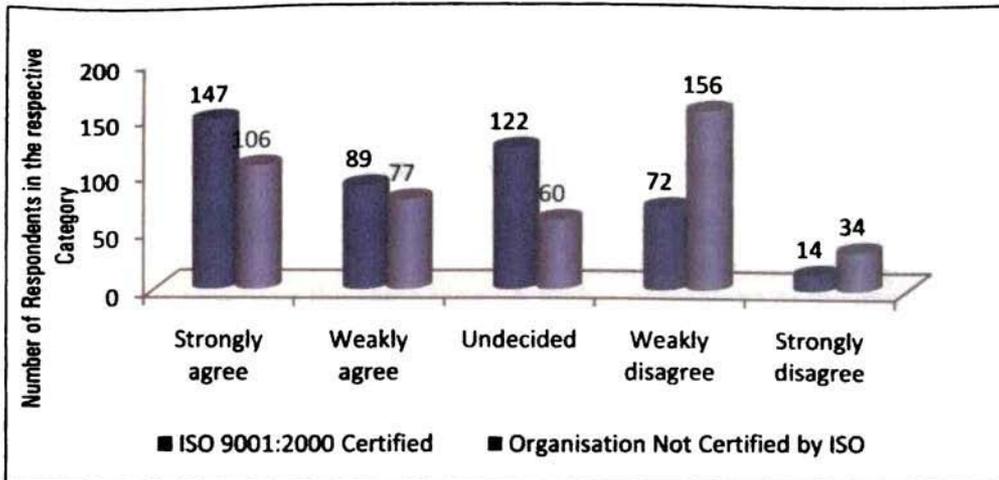
**Table: 5.42 (Question 15)**

**Distribution of responses from the employees on knowledge of current and future needs of the customer (*Data based on the survey*)**

<b>Status of certification</b>	<b>Strongly agree</b>	<b>Weakly agree</b>	<b>Undecided</b>	<b>Weakly disagree</b>	<b>Strongly disagree</b>	<b>Total</b>	<b>Mean</b>	<b>SD</b>	<b>Sig (2 tailed)</b>
ISO 9001:2000 Certified	147 (33.10)	89 (20.05)	122 (27.48)	72 (16.22)	14 (3.15)	444 (50.63)	3.64	1.19	.000
Not Certified by ISO 9001:2000	106 (24.48)	77 (17.78)	80 (13.88)	158 (38.03)	34 (7.85)	433 (100)	3.15	1.35	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.23 represents distribution of responses from the employees on knowledge of current and future needs of the customer.



**Exhibit: 5.23** Distribution of responses from the employees on knowledge of current and future needs of the customer.

From Table 5.42 and Exhibit 5.23, it is seen that 19.37% of the employees in ISO 9001:2000-certified organizations have not agreed that they know the current and future needs of the customers. The corresponding value for employees in organizations not certified by ISO 9001:2000 is 43.88%. It is also observed that ISO 9001:2000-certified organizations have a high percentage of employees who are undecided on this question. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 67.78 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference between the means is significant or not, an independent sample t-test was carried out. The mean responses are computed; the values are 3.64 and 3.15 respectively for ISO 9001:2000-certified organizations and those not certified by ISO 9001:2000. The difference between the two means as seen from the value of significance in the 2-tailed test is significant indicating that the employees of ISO 9001:2000-certified organisations have a better

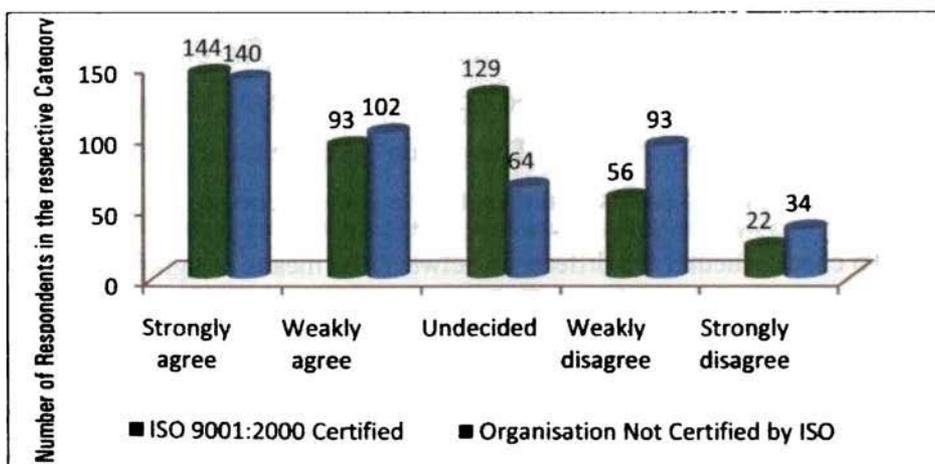
knowledge of the current and future needs of the customer. Undertaking systematic customer reviews, organizing customer meets at a fixed periodicity, calling for customer feedback and acting on the feedback promptly keep the customers always close to the employees as well as to the organization. Table 5.43 gives Distribution of responses from the employees on listening to customers' voice. Same data is pictorially represented in Exhibit 5.24.

**Table: 5.43 (Question 16)**  
**Distribution of responses from the employees on listening to customers' voice (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	144 (32.43)	93 (20.94)	129 (29.06)	56 (12.62)	22 (4.95)	444 (100)	3.63	1.20	.154
Not Certified by ISO 9001:2000	140 (32.33)	102 (23.56)	64 (14.78)	93 (21.48)	34 (7.85)	433 (100)	3.51	1.34	

**Note: The figures given in parentheses are the percentages of the responses.**

Exhibit 5.24 which represents distribution of responses from the employees on listening to customers' voice is given below.



**Exhibit: 5.24** Distribution of responses from the employees on listening to customers' voice.

As can be seen from Table 5.43 and Exhibit 5.24, 17.57% of the employees in ISO 9001:2000-certified organisations do not subscribe to the view that listening to the voice of the customer would help to optimise the features of the product. 29.33% of the employees from the other category of organizations also have the same view. A higher percentage of the employees in ISO 9001:2000-certified organizations are undecided on this issue. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 33.99 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

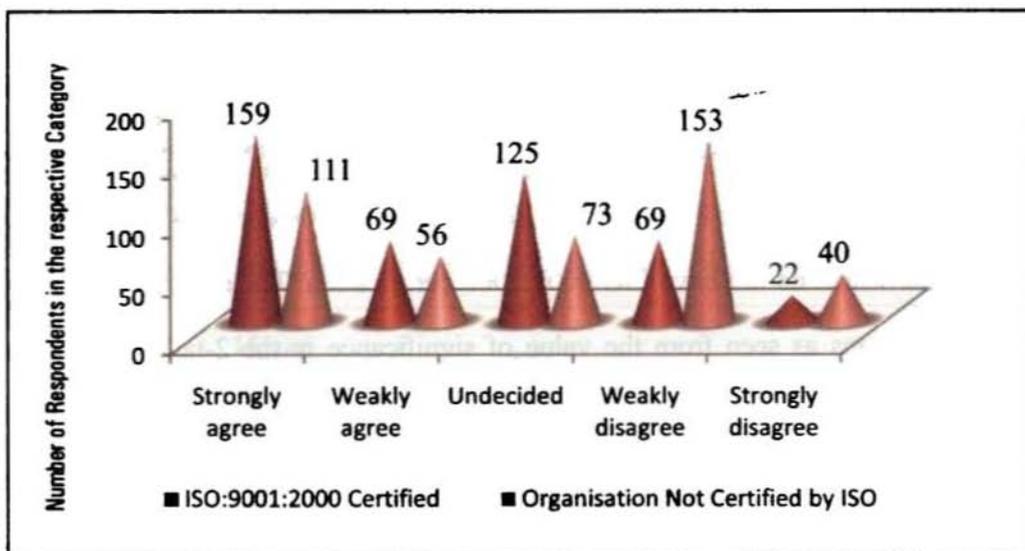
To check whether the difference between the means is significant or not, an independent sample t-test was carried out. The mean responses are computed; the values are 3.63 and 3.51 respectively for ISO 9001:2000-certified organisations and those which do not have ISO 9001:2000 certification. The difference between the two means as seen from the value of significance in the 2-tailed test is not significant, indicating that the employees in both types of organisations have almost the same view on listening to the voice of the customer. The reason may be that while customer focus is a mandatory feature of ISO 9001:2000 organisations, this has become a pressing need for those who do not have this quality certification as well, on account of severe competition. Distribution of responses from the employees on monitoring and measuring customer feedback is given in 5.44 and its pictorial view in Exhibit 5.25.

**Table: 5.44 (Question 17)**  
**Distribution of responses from the employees on monitoring and measuring customer feedback (Data based on the survey)**

Status of certification	Strongly agree	Weakly agree	Undecided	Weakly disagree	Strongly disagree	Total	Mean	SD	Sig (2 tailed)
ISO 9001:2000 Certified	159 (35.81)	69 (15.54)	125 (28.16)	69 (15.54)	22 (4.95)	444 (100)	3.61	1.25	.000
Not Certified by ISO 9001:2000	111 (25.64)	56 (12.94)	73 (16.86)	153 (35.33)	40 (9.23)	433 (100)	3.10	1.37	

*Note: The figures given in parentheses are the percentages of the responses.*

Exhibit 5.25 represents pictorially Distribution of responses from the employees on monitoring and measuring customer feedback.



**Exhibit: 5.25** Distribution of responses from the employees on monitoring and measuring customer feedback.

Table 5.44 and Exhibit 5.25 give the input that 20.49% of the employees in ISO 9001:2000 certified organisations are not of the view that monitoring and measuring the feedback of the information on Customer Satisfaction helps

to understand the future needs. In the case of organizations without ISO 9001:2000 certification, 44.56% of the employees subscribe to the same view. The percentage of employees who are undecided on this question is high in ISO 9001:2000 certified organization. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The computed Chi square value was 60.42 at 4 degrees of freedom. This value indicated that the difference is significant at 5% level. It was found that there is difference in the pattern.

To check whether the difference between the means is significant or not, an independent sample t-test was carried out. The mean responses are computed; the values are 3.61 and 3.10 respectively. The difference between the two means as seen from the value of the significance in the 2-tailed test is significant. This confirms the effect of the actions the ISO 9001:2000-certified organizations take for understanding the future needs of the customer, with the help of monitoring and measuring the feedback information. These demonstrate better customer relation on account of the continuous interaction with the customers and existence of adequate avenues for discussions with them.

Having gone through all the attributes of Customer Satisfaction, we have to find out whether there is any association between the questions in the same group. For this, correlation matrix is tabulated and analysed. Table 5.45 gives the Correlation matrix for Customer Satisfaction.

**Table: 5.45**  
**Correlation matrix for Customer Satisfaction**

<b>Variables</b>	<b>Knowledge of current and future needs</b>	<b>Listening to customers' voice</b>	<b>Monitoring and measuring customer feedback</b>
Knowledge of customer complaints (Question No.3)	.174 (.000)	.027 (.210)	.085 (.006)
Knowledge of current and future needs (Question No.15 )		.291 (.000)	.195 (.000)
Listening to customers' voice (Question No.16 )			.331 (.000)

*Note: values given in the parentheses denote the p- value.*

As can be seen from Table 5.45, the correlation between knowledge of customer complaints and the factors listening to customers' voice and monitoring and measuring customer feedback is not significant.(  $p > .05$ ). In all other cases there is significant relation among the factors. In the cases where the correlation is less than  $\pm .300$ , the strength of correlation could be treated as low. In the present case, the correlation among all the other attributes is low. The presence of correlation indicates that the questions are not totally independent, which means that there may be underlying factors common to some of the questions. To identify these, factor analysis is carried out. Since the initially extracted factors could not be clearly identified, factor rotation was done and the resultant factor loadings are as follows. Table 5.46 gives the factor loadings got after rotation factor analysis.

**Table: 5. 46**  
**Rotation Factor Analysis- Factor Loadings**

Questions	F1	F2	F3	F4
Q3	.038	.996	.084	.005
Q15	.086	.088	.982	.140
Q16	.164	.005	.143	.976
Q17	.982	.040	.086	.161
Percentage variance	27.95	26.05	24.03	21.97

It can be noted from Table 5.46 that:

Factor I (F1) is closely associated with question 17, and it has no close association with any other question. This factor can be named 'Monitoring and measuring of customer feedback'.

Factor II (F2) has close association with question 3, and it has no association with any other question. 'Knowledge of customer complaints' is the name given for this factor.

Factor III (F3) is closely associated with question 15. It does not have any association with other questions. This factor is named 'Knowledge of current and future customer needs'.

There is close association for factor IV (F4) with question 16. The association of this factor with other questions is weak. This factor is termed 'Customers' voice;

All the factors have more or less the same explained variance and each factor is found mainly associated with one question. As each factor represents the corresponding question, the questions themselves could be considered as factors. The mean Scores for Customer Satisfaction is given in table 5.47.

**Table: 5.47**  
**Mean Scores for Customer Satisfaction**

<b>Status of certification</b>	<b>Monitoring and measuring of customer feedback (Factor 1)</b>	<b>Knowledge of customer complaints (Factor 2)</b>	<b>Knowledge of current and future customer needs (Factor 3)</b>	<b>Customers' voice (Factor 3)</b>	<b>Overall index of Customer Satisfaction</b>
ISO 9001:2000 certified	3.61 (1.36)	3.30 (1.19)	3.64 (1.20)	3.63 (1.25)	3.54
Organisation Not Certified by ISO 9001:2000	3.10 (1.38)	2.87 (1.35)	3.15 (1.34)	3.51 (1.36)	3.16
t-value	-4.582	-5.688	-1.427	-5.801	
p-value	(.000)	(.000)	(.154)	(.000)	

*Note: values given in the parentheses denote the standard deviation*

In the case of factors except knowledge of current and future needs of the customer, ( $p > .05$ ) there is no difference between organizations which are certified by ISO 9001: 2000 and those which are not certified by it, in respect of Customer satisfaction.

The hypothesis framed states that “Customer Satisfaction is higher in ISO 9001:2000-certified organizations in comparison to what is practised by organizations which do not have ISO 9001:2000 certification”. In order to test the hypothesis, a t- test was carried out. t-value obtained is 4.43, which is greater than table value of 1.97. As there is difference between the two types of organizations, the null hypothesis is rejected and so the hypothesis under test accepted.

### **5.3. Testing of the stated hypotheses in the study**

As a part of the study, six hypotheses were proposed. These relate to the dimensions of quality, such as top management commitment, employee involvement, team working, continual improvement, internal communication, and Customer Satisfaction. Relevant questions were framed so as to extract the information pertaining to each attribute of the dimensions.

The stated hypotheses are:

1. Top Management Commitment is higher in ISO 9001:2000 -certified organisations, compared to what is observed in those not certified by ISO 9001:2000 standards.
2. ISO 9001:2000-certified organisations display a higher level of Employee Involvement in comparison to that seen in organisations which are not qualified by ISO 9001:2000 standards.
3. Better Team Working exists in ISO 9001:2000-certified organizations compared to that in organizations not certified by ISO 9001:2000 standards.
4. ISO 9001:2000-certified organizations practise Continual Improvement more meticulously in comparison to those which are not ISO 9001:2000-certified.
5. ISO 9001:2000-certified organizations put higher thrust on internal communication compared to those which are not ISO 9001:2000-certified.
6. Customer Satisfaction is higher in ISO 9001: 2000-certified organizations in comparison to what is practised by organizations which do not have ISO 9001:2000 certification.

The testing of the hypotheses is summarized in the following pages.

**Hypothesis: 1:** Top Management Commitment is higher in ISO 9001:2000 certified organisations, compared to what is observed in those not certified by ISO 9001:2000 standards.

The objective of this study was to evaluate and compare the level of existence of top management commitment, in the quality management practices followed in ISO 9001:2000-certified organisations, with those in the organisations which do not have ISO 9001:2000 certification. Management commitment has five attributes: identification of product realisation processes, recognition, appreciation and giving rewards for outstanding contribution, warning for committing errors by the employees as a part of employee management, establishment of quality objectives and provision of trained resources towards project implementation. These attributes are reflected in the responses to question numbers 6, 7, 8, 14 and 24 respectively. The questions are assumed to be independent of one another. The comparative level of existence of these attributes was assessed based on the perception of the employees towards each of the questions, recorded during the survey. Each question was framed to represent the respective attribute and the data was collected using a five-point Likert-scale. The responses of the employees are considered as indicators of the level of existence of these attributes. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out for all of these. The values indicated that the difference is significant at 5% level. Hence it has been inferred that there is difference in the pattern.

To find out whether the level of existence is the same or different in both types of organisations, an independent sample t-test was conducted and this confirmed whether the difference of means is significant or not. The next step was to examine whether there is correlation between the questions. The correlation

matrix revealed that the correlation between the questions is very low. However, the p- values gave an indication of the extent of the relation between the attributes (Table 5.11). The overall indices of top management commitment, as seen from the mean scores is 3.60 and 3.38 respectively for ISO 9001:2000-certified organisations and those which are not certified by ISO 9001:2000 standards. It is also noted that the difference is significant in the case of the attributes identification of product realization processes, warning for commitment of errors by the employee, and establishment of quality objectives. In the case of the other attributes, such as recognition and appreciation for outstanding contributions, and provision of trained resources, there is no significant difference between the two categories of organisations. .

A t-test was carried out to ascertain whether the hypothesis could be accepted or not. The t- value was calculated for both types of organisations, to ascertain whether the hypothesis is could be accepted. The calculated t- value is 2.47, which is higher than table value of 1.97 at 5 % level of significance. As there is difference between the two types of organizations, the null hypothesis is rejected and the hypothesis under test accepted.

**Hence Hypothesis 1 is accepted.**

**Hypothesis: 2:** ISO 9001: 2000 certified organisations display a higher level of Employee Involvement in comparison to that seen in organisations which are not qualified by ISO 9001:2000 standards.

The objective of this study was to investigate the extent of Employee Involvement in ISO 9001: 2000-certified organisations as well as in those which are not ISO 9001:2000-certified and draw comparison between them. Employee Involvement has four attributes: establishment of individual and team objectives, promotion of innovative efforts, team effort for management of processes and evaluation of results and involvement in objective setting and

decision making. Question numbers 1, 2, 4 and 13 respectively represent these attributes. The questions are assumed to be independent of one another. Each question was framed to represent the respective attribute and the data was collected using a five-point Likert-scale. The responses of the employees are considered as indicators of the level of existence of these attributes. The comparative level of Employee Involvement in both types of organisations was assessed based on the responses of the employees towards each of the questions recorded during the survey. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out for all of the attributes. The values indicated that the difference is significant at 5% level. Hence it could be inferred that there is difference in the pattern.

The next step in the analysis was to examine whether there is correlation between the questions. The examination of the correlation matrix in Table 5.17 revealed that there is some relation between the questions. In order to find out whether there are any underlying factors, factor analysis was carried out. After the initial extraction of scores, the factor rotation analysis was carried out to closely identify the factors which are independent of one another and rotated factor loading was tabulated (Table 5.17 and 5.18). The analysis of the factor loadings revealed that all the factors have more or less the same explained variance and that each factor is mainly loaded with only one question. This means that each factor represents the corresponding question. In other words, the questions themselves could be considered to be factors. The overall indices of employee involvement, as seen from the average scores is 3.91 and 3.56 respectively for ISO 9001:2000-certified organisations and for those which have not gone in for certification. The overall index of the Employee Involvement seems marginally better in ISO 9001:2000 organisations. In the case of the factors, maturity in objective setting and decision making and

establishment of objectives, the difference is significant between ISO 9001: 2000-certified organisations and those which do not have the certification. In the case of the other two factors, performance management and innovative initiative the difference is not significant, as seen from the average scores (Table 5.19). A t-test was carried out to ascertain whether the hypothesis can be accepted or not. The t- value was calculated for both types of organisations. The calculated t- value is 3.72, which is higher than the table value of 1.97 at 5 % level of significance. As there is difference between the two types of organizations, the null hypothesis is rejected and hence the hypothesis under test accepted.

**Hence Hypothesis 2 is accepted.**

**Hypothesis: 3:** Better Team Working exists in ISO 9001:2000-certified organizations compared to that in organizations not certified by ISO 9001:2000 standards.

The objective of this hypothesis was to assess the existence of Team Working in both types of organisations and draw comparison between these. The attributes of Team Working are: pooling of expertise, participation in process improvements, cause and effect analysis and shared vision to take decisions. These attributes are represented by question numbers 5, 10, 21, and 22, in the order. Each question was framed to represent the respective attribute and the data was collected using a five-point Likert-scale. The responses of the employees are considered to be indicators of the level of existence of these attributes. The comparative level of team work in both types of organisations was assessed based on the responses of the employees towards each of the questions recorded during the survey. The questions are assumed to be independent of one another. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out

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for all the attributes. The values indicated that the difference is significant at 5% level. Hence it was inferred that there is difference in the pattern.

To find out whether the level of existence is the same or different in both types of organisations, an independent sample t-test was conducted and this confirmed whether the difference of means is significant or not.

To examine whether there is relation between the questions, the correlation matrix was tabulated. An examination of this revealed that there is some relation between the questions. Factor analysis was conducted in order to find out whether there are any underlying factors. After the initial extraction of scores, the factor rotation analysis was done to closely identify the factors which are independent of one another and rotated factor loading was tabulated (Table 5.24 and 5.25). The analysis of the factor loadings revealed that all the factors have more or less the same explained variance and that factor is mainly loaded with only one question. This means that each factor represents the corresponding question. In other words, the questions themselves could be considered to be factors. It is seen from the mean scores that the overall indices of Team Working are 3.52 and 3.48 respectively for ISO 9001:2000-certified organisations and those which are not certified by this standard. The overall index of Team Working is marginally better in ISO 9001:2000-certified organisations. However, in the case of all the factors except quality upgradation through quality improvements, the difference between the responses in the two types of organisations, as seen from the mean scores, is not significant (Table 5.26).

A t-test was carried out to ascertain whether the hypothesis could be accepted or not. The t-value is calculated for both types of organisations, to ascertain whether the hypothesis could be accepted. The calculated t-value is, 0.63 and is lower than the table value of 1.96 at 5% level of significance. As

there is no difference between the two types of organizations, the null hypothesis could be accepted and the hypothesis under test rejected.

**Hence Hypothesis 3 is rejected.**

**Hypothesis: 4:** ISO 9001:2000-certified organizations practice Continual Improvement more meticulously in comparison to those which are not ISO 9001:2000-certified.

The objective of this study was to evaluate the status of Continual Improvement in ISO 9001: 2000-certified organisations and those which do not have a quality certification and to strike a comparison. Continual Improvement has four attributes: enhancement of effectiveness and efficiency, overview and validation of improvements, balanced documentation and awareness of cost of quality. Question numbers 11, 12, 20 and 23 respectively represent these attributes. The questions are assumed to be independent of one another. Each question was framed to represent the respective attribute and the data was collected using a five-point Likert-scale. The responses of the employees are considered to be indicators of the level of existence of these attributes. The comparative level of Continual Improvement in both types of organisations was assessed, based on the responses of the employees towards each of the questions recorded during the survey. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out for all the attributes. The values indicated that the difference is significant at 5% level. Hence it could be inferred that there is difference in the pattern.

To find out whether the level of existence is the same or different in both types of organisations, an independent sample t-test was conducted and this confirmed whether the difference of means is significant or not.

The next step in the analysis was to examine whether there is relation between the questions and in order to find out this, the correlation matrix was tabulated. The examination of the correlation matrix revealed that there is some relation between the questions. Factor analysis was conducted in order to find out whether there are any underlying factors. After the initial extraction of scores, factor rotation analysis was carried out to closely identify the factors which are independent of one another and rotated factor loading was tabulated (Table 5.31 and 5.32). The analysis of the factor loadings revealed that all the factors have more or less the same explained variance and that each factor is mainly loaded with only one question. This means that each factor represents the corresponding question. In other words, the questions themselves could be considered to be factors. The overall indices of continual improvement, as seen from the average scores are 3.88 and 3.62 respectively ISO 9001:2000-certified organisations and those which have not gone in for certification. The overall index of continual improvement, is marginally better in ISO 9001:2000 certified organisations organisations. In the case of the factors, except in awareness of quality cost and balanced documentation, the difference is not significant, as seen from the average scores (Table 5.33). A t-test was carried out to ascertain whether the hypothesis could be accepted or not. The t- value is calculated for both types of organisations, to ascertain whether the hypothesis could be accepted. The calculated t- value is 2.07 which is higher than the table value of 1.96.at 5 % level of significance. As there is difference between the two types of organizations, the null hypothesis is rejected and the hypothesis under test accepted.

**Hence Hypothesis 4 is accepted.**

**Hypothesis: 5:** ISO 9001:2000-certified organizations put higher thrust on internal communication compared to those which are not ISO 9001:2000-certified.

The objective of this study is to verify whether there is sufficient thrust on internal communication in organizations which are certified by ISO 9001:2000 in comparison to those which are not. The attributes of internal communication are self improvement, freedom to communicate feedback on obstacles, effectiveness of quality management system across the organisation, and efficiency in communicating objectives and accomplishments. These attributes are represented by question numbers 9, 18, 19 and 25 in order. Each question was framed to represent the respective attribute and the data was collected using a five-point Likert-scale. The responses of the employees are considered to be the indicators of the level of existence of these attributes. The comparative level of Internal Communication in both types of organisations was assessed, based on the responses of the employees to each of the questions recorded during the survey. The questions are assumed to be independent of one another. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The values indicated that the difference is significant at 5% level. Hence it is inferred that there is difference in the pattern.

To find out whether the level of existence is the same or different in both types of organisations, an independent sample t-test was conducted and this confirmed whether the difference of means is significant or not.

To examine whether there is correlation between the questions, correlation matrix was tabulated as the next step in the analysis. The

examination of this matrix revealed some relation between the questions. In order to find out whether there are any underlying factors, factor analysis was conducted. After the initial extraction of scores, factor rotation analysis was carried out to closely identify the factors which are independent of one another and rotated factor loading was tabulated (Table 5.38 5.39). The analysis of the factor loadings revealed that all the factors have more or less the same explained variance and that each factor is mainly loaded with only one question. This means that each factor represents the corresponding question. In other words the questions themselves could be treated as factors. The overall indices of internal communication, as seen from the average scores, are 3.40 and 3.33 respectively for ISO 9001:2000-certified organisations and those which have not gone in for certification. The overall index of internal communication is slightly better in ISO 9001:2000-certified organisations. However, in the case of all the factors, except freedom to communicate the obstacles faced, the difference is not significant, as seen from the table of average scores. A t-test was carried out to ascertain whether the hypothesis could be accepted or not. The t-value is calculated for both types of organisations, to ascertain whether the hypothesis could be accepted. The calculated t- value is 1.52, which is lower than the table value of 1.97, at 5 % level of significance. As there is no difference between the two types of organizations, the null hypothesis accepted and the hypothesis under test rejected.

**Hence Hypothesis 5 is rejected.**

**Hypothesis: 6:** Customer Satisfaction is higher in ISO 9001: 2000-certified organizations in comparison to what is practised by organizations which do not have ISO 9001:2000 certification.

The objective of this study is to check the extent of Customer Satisfaction prevalent in ISO 9001:2000-certified organizations and compare it

with that in organizations which do not have ISO 9001:2000 certification. Customer Satisfaction has four attributes: knowledge of customer complaints, knowledge of current and future needs, listening to customers' voice, and monitoring and measuring customer feedback. Question numbers 3, 15, 16, and 17 respectively represent these attributes. Each question was framed to represent the respective attribute and the data was collected using a five-point Likert-scale. The responses of the employees are considered to be indicators of the level of existence of these attributes. The comparative level of Customer Satisfaction in both types of organisations was assessed based on the responses of the employees towards each of the questions recorded during the survey. The questions are assumed to be independent of one another. In order to check whether the pattern of responses from the two types of organizations is different, Chi square test was carried out. The values indicated that the difference is significant at 5% level. Hence it was inferred that there is difference in the pattern.

To find out whether the level of existence is the same or different in both types of organisations, an independent sample t-test was conducted and this confirmed whether the difference of means is significant or not

The next step in the analysis was to examine whether there is correlation in the questions and for this the correlation matrix was tabulated. The examination of the matrix revealed that there is some correlation between the questions. Factor analysis was conducted in order to find out whether there are any underlying factors. After initial extraction of scores, the factor rotation analysis was done to closely identify the factors independent of each other and rotated factor loading was tabulate. (Table 5.45 and 5.46). The analysis of the factor loadings revealed that all the factors have more or less same explained variance and that each factor is mainly loaded with only one question. This

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means that each factor represents the corresponding questions. In other words the questions themselves could be regarded as factors. The overall indices of Customer Satisfaction , as seen from the average scores, is 3.54 and 3.16 respectively for ISO 9001:2000-certified organisations and those which have not gone in for certification. The overall index of Customer Satisfaction seem marginally better in organisations not certified by ISO 9001:2000. However, in the case of all the factors except knowledge of current and future customer needs, there is significant difference between the responses in the two types of organisations as seen from the average scores (Table 5.47). A t-test was carried out to ascertain whether the hypothesis could be accepted or not. The t- value was calculated for both types of organisations, to ascertain whether the hypothesis could be accepted. The calculated t- value is 8.72, which is higher than the table value of 1.97 at 5 % level of significance. As there is no difference between the two types of organizations, the null hypothesis is rejected and the hypothesis under test accepted.

**Hence Hypothesis 6 is accepted.**

From the prima facie findings of the acceptance of four out of the six hypotheses it could be concluded that ISO 9001: 2000-certified organisations fare better in the attributes such as Top Management Commitment, Employee Involvement, Continual Improvement and Customer Satisfaction. This gave a better edge for ISO 9001:2000-certified organizations to excel those which are not certified for quality. In the case of the other two attributes, Team Working and Internal Communication, organisations not certified by ISO 9001:2000 standards seem to be doing better. This gives the understanding that ISO 9001:2000 implementation does not give a total guarantee improvement in quality. It would also lead one to the inference that either ISO 9001:2000-certified organisations take a relaxed view, once the label is got, or the organisations which have not gone in

for ISO 9001:2000 certification take business more seriously and work for better quality. Yet another observation is that in the case of all the attributes, a high percentage of the respondents from the ISO 9001:2000-certified organisations have been undecided, while recording their response in the Likert scale (5-1). This indicates that the respondents have some reluctance in accepting the usefulness of implementation of ISO 9001:2000 9001: 2000 standard. The comparative values of the mean scores for the various attributes, in the case of both types of organisations, are given in the Table 5.48

**Table 5.48**  
**Mean Scores for the Attributes**

<b>Attribute</b>	<b>Overall index of mean scores for ISO 9001:2000 certified organisations</b>	<b>Overall Index of mean Scores for Organisations not certified by ISO 9001:2000</b>
Top management commitment	3.60	3.38
Employee involvement	3.91	3.56
Team working	3.52	3.48
Continual improvement	3.88	3.62
Internal communications	3.40	3.33
Customer Satisfaction	3.54	3.16

The value of the mean scores is between 3 and 4 for both types of organisations, which indicates that, as per the perception of the employees, the level of agreement lies between ‘undecided’ and ‘weakly agree’, for all the attributes. This does not give a clean chit of guarantee of quality either category of organisations. The value is marginally higher for ISO 9001: 2000-certified organisations for all the attributes, and this gives a better edge for these as far as the quality management practices followed are concerned.

## **6.1 Summary of the Study**

The present study discusses the issues which show up in the quality management practices of ISO 9001:2000-certified organisations as well those without ISO 9001:2000 certification. The topic of study is the impact of ISO 9001:2000 on quality management practices in selected organisations in Kerala. The tool used is a structured questionnaire, which has been arrived at, after conducting a pre test. This study is descriptive in nature and covers central Kerala including Trivandrum, Kochi, Alleppey and Kottayam. This researcher has visited all the organisations covered in the survey and held discussions with department heads, management representatives and the employees to collect first hand information on the activities specifically aimed at the quality management practices followed in the organisations.

## **6.2 The Findings of the study**

The findings of the study are grouped into seven heads based on the quality dimensions. The agreements and disagreements of the employees to the various questions are considered while arriving at the findings. The severity and importance of the observation with respect to the question are taken in to account while choosing the feedback from the responses.

### **6.2.1 The observation from the findings of Top Management Commitment**

The observation on the existence of the levels of existence of quality attributes of Top Management Commitment in both categories of organizations has revealed the following facts:

- 27.48% and 39.04 % of the employees of ISO 9001:2000-certified organizations and those not certified respectively have not agreed that the top management identifies the product realization processes.
- It is noted that 49.11 % and 46.65 % of the employees respectively of ISO 9001:2000 certified organisations and those which are not have confirmed that the employees are recognized and appreciated for the good work done.
- 25.46 per cent of the employees of ISO 9001:2000 certified organisations and 22.87 per cent of the other category have not agreed with the statement that erring employees are pulled up when the performance is not satisfactory.
- The survey data shows that 46.84% of the employees from ISO 9001:2000-certified organizations and 50.81% from the other category have opined that quality objectives are established by the top management.
- Regarding the availability of trained resources, 26.37% of the employees of ISO 9001:2000 certified organizations and 42.02% of the other category have expressed their view that top management is not meeting the needs of the trained resources.

### **6.2.2 The findings from the analysis of Employee Involvement**

- 17.62 % of the employees of ISO 9001:2000 certifies organizations and 27.26% of the other category feel that they are not associated with the process of establishing individual and team objectives

- As regards the encouragement of innovative efforts, 58.10% and 62.13% of the employees of ISO 9001:2000-certified and the organizations without this certification are in agreement to the support of top management.
- 17.79% of employees of ISO 9001:2000 organisation and 30.49 of the other category do not seem to have involved in the process of process performance and management of results.
- In the process of objective setting and decision making, 26.58 % and 39.02% respectively of the employees of ISO 9001:2000 and the other category of organizations have expressed their view that they have not been involved

### **6.2.3 The analysis of Team working, as perceived by the respondents**

- 25% of the employees of ISO 9001:2000-certified organizations and 29.80% of the employees from the organisation without ISO 9001:2000 certification are of the view that pooling of expertise and resources do not help to tackle problems.
- As regards participation in process improvements related to quality up gradation, 50.22% of the employees of ISO 9001:2000-certified organizations and 60.04% from the other category agree that they get opportunity to participate in this process.
- 21.39% and 35.33% of the employees of ISO 9001:2000 and the other category of organizations opine that there is no team to carry out cause and effect analysis.
- On the point of shared vision guiding to take decisions on technical matters, 64.05% employees from ISO 9001:2000 and 55.19% from organizations without ISO 9001: 2000, have shown their agreement.

## **6.2.4 The findings from the analysis on Continual Improvement**

- 14.86% of employees from ISO 9001:2000-certified organizations and 33.94% from the other category do not feel that the processes of the organisation are continually improved to enhance effectiveness and efficiency.
- In respect of the over viewing and validation of improvements, 59.91% and 55.66% of the employees of ISO 9001:2000 organizations and those without ISO 9001:2000 respectively, are in agreement with the existence of this process.
- 52.48% of the employees of ISO 9001:2000-certified organizations and 60.27 from the organisations without ISO 9001:2000 have concurred that the improvements as well as failures are documented with the same vigour.
- As regards cost of quality, 19.14 % of the employees of ISO 9001:2000 organisations and 27.62% of the other category have stated that they are not aware of the cost of quality.

## **6.2.5 Feedback from the analysis of data in respect of Internal Communication**

- As regards self improvement programme, 27.04% and 33.25% of the employees of ISO 9001:2000 and the other category of organisation have opined that there is no such activity in their departments
- 27.70% and 46.42% of the employees of ISO 9001:2000 and the other category of organizations do not feel that they are encouraged to communicate the feedback on the obstacles faced by them in achieving improvement goals.

- In respect of communication on the effectiveness of quality management system across the organisation, 43.46% against 50.80% of the employees of the ISO 9001:2000 and the other category agree that this process takes place.
- 20.50% and 30.96% of the employees of ISO 9001:2000-certified organisation and those without certification have indicated that communication of objectives and accomplishments are not communicated effectively.

### **6.2.6 Analysis of Customer Satisfaction**

- In respect of knowledge of current level of customer complaints, 33.11% of employees of ISO 9001:2000 organisations and 52.19% of the other category are not aware of the current level of customer complaints
- As regards the awareness of current and future needs of the customers, 19.37% and 43.88% respectively of the employees of the two types of organizations in order have expressed that they are not aware of these.
- 53.37% of the employees of ISO 9001:2000 organizations and 55.89% from the other category feel that listening to the customers' voice helps to optimise the features of the product.
- As regards the usefulness of monitoring and measuring of the feedback of information on Customer Satisfaction , 51.35% and 38.585 of the employees of the ISO 9001:2000-certified organisation and those without ISO 9001:2000-certification respectively are in agreement with it.

### **6.3 Other important findings of the study**

Out of the six dimensions of quality management systems investigated in this study, Top Management Commitment, Employee Involvement, Continual Improvement and Customer Satisfaction are observed to be better practiced in ISO 9001:2000-certified organizations. In the case of the other two dimensions, Team Working and Internal Communication, organisations which are not certified for ISO 9001:2000 standards are found to be faring better. One of the reasons for the not so uniformly excellent performance of ISO 9001:2000-certified organisations in all the six dimensions of quality could probably be the setting in of a little bit of complacence and developing over confidence due to the possession of ISO 9001:2000-certification. Hand in hand, the organizations without ISO 9001:2000-certification must be taking business more seriously, and practicing the ethos of quality to overcome the stiff competition, thereby excelling in three dimensions. An information the researcher could collect during the survey is that, the documentation which has to be followed for ISO 9001: 2000, and the manpower needed for this, pull back the organizations without certification from implementing ISO 9001:2000 standards. It is possible that this can be overcome by adopting electronic means for storage, processing and retrieval of data, and moving towards a paperless office.

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**CONCLUSIONS AND RECOMMENDATIONS**

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**7.1 Introduction**

The research work which was carried out to study the impact of ISO 9001: 2000, in selected organisations in Kerala, spread over various types of activities, such as fabrication of aero space hardware, glass ware, construction industries, health care units etc, encompassing, government and private enterprises, public sector undertakings, small and medium scale industries and research and development establishments. The ambience, work culture and collaboration prevalent in these organisations were varying on account of the environment in which they have been working. Fifty percent of the organizations selected for the study had obtained the ISO 9001: 2000-certification since seven years or more. The process of study undertaken could invoke interest in the respondents, when a brief explanation on the purpose and need of the study was given to them prior to conducting the survey. There has been total cooperation from the management and the employees of all the organisations for the conduct of the study. Personal discussions were held with the senior management to draw their total support and involvement for the study.

Logical conclusions are drawn from the results of the analysis and the interpretation carried out from the findings of the survey. The test results of the hypotheses gave the direction for arriving at the following inferences.

- i. By and large, the organisations which are certified for ISO 9001:2000 perform quality management practices, marginally better than the organisations which are not certified by this standard.
- ii. The work culture and the leadership of the top management in organizations not certified for quality have been spear heading to achieve higher levels of excellence.
- iii. There have been observations which lead to the inference that complacency is setting in, some organizations which are certified by ISO 9001: 2000 standard, over a period of time, as they feel too confident of their existing quality label. All the organisations surveyed in this category are certified for quality over a period of seven years and more and hence the conclusions could be justified.
- iv. The processes used for storing and retrieval of data are age old and hence take longer time and chances of making mistakes are more due to the voluminous nature of the data.
- v. Though there is a significant difference between the two types of organisations for maintenance of discipline, which is reflected by the warning management issues to the erring employees, the index is lower for ISO 9001:2000-certified organisations. This also causes concern.
- vi. Out of the six hypotheses, those on Top Management Commitment, Employee Involvement, Continual Improvement and Customer Satisfaction have been accepted and the ones on Team Working and Internal communication have been rejected. The areas of improvement for ISO 9001: 2000 certified organizations are top management commitment, Team Working and internal communication. Organisations which are not certified by ISO 9001:2000 standard may have to pay more attention to reinforce employee involvement,

**Continual Improvement and Customer Satisfaction if they are to remain competitive in the present environment.**

The following observations have emerged out from the study.

- i. ISO 9001:2000-certified organisations can sustain quality and thereby perform better by practicing of quality circles more seriously, making cross functioning teams effective, and conducting frequent quality reviews. These can also streamline business processes in an organization and thus ensure a stronger foundation for cost effectiveness, improvement of quality within the constraints of time and resources. If the maintenance of quality is taken seriously, after obtaining the QMS certification, overall growth can be assured.
- ii. Organisations which are not certified by ISO 9001:2000 standard can do a better job, if they start practising quality management systems, without the fear for the efforts of documentation, by adopting modern methods. This can bring down the effort of supervision and vigilance, over and above bringing in a synergic effect.

The rejection of the two hypotheses can be well explained in the light of the following data obtained from the literature survey:

- a. The research paper “Why Firms Seek ISO 9001:2000-Certification: Regulatory Compliance or Competitive Advantage” by Shannon et al. gives the indication that organizations view ISO 9001:2000 Certification as a credible public signal of effective quality management practice.
- b. This is further corroborated by the findings of the study of Zhiwei and Larry brought out through the paper “A Comparison of quality programmes: Total Quality Management and ISO 9001:2000.” Based on the experience in Erickson Inc and Champion International, it states that ISO 9001:2000 registration does not guarantee the quality of the

product; it guarantees only attesting the quality practices followed in the company.

## **7.2. Limitations of the study**

- The research study was concentrated in selected organizations in Kerala.
- A longitudinal study would have brought out the change in the level of quality of the organization, over a period of time. However this was not undertaken , as it is beyond the scope of the present study,

## **7.3. Scope for further work**

- The scope of work could be enlarged to more number of industries and locations in Kerala
- A longitudinal study may be undertaken to observe how the quality is sustained over a period of time.
- Acquisition of patents , copyrights etc could be added in the scope of the research work, to assess the efforts taken in the direction of instilling innovation and creativity

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## ORGANISATIONS SELECTED FOR THE SAMPLE

Sl. No	Name of the Firms	Category/ Quality Certification	Nature of Business	Number of Respondents	%
1.	M/s. Terumo Penpol Pvt. Limited, Trivandrum	Private / ISO 9001:2000	Health care	39	4.45
2.	M/s. Hindustan Latex Limited, Trivandrum	Public / ISO 9001:2000 Ltd.Co. under Govt. of India	Health care	19	2.17
3.	M/s Skyline Builders, Trivandrum	Private/ ISO 9001:2000	Civil construction	39	4.45
4.	M/s Bhagheeratha Engg. Limited, Kochi	Private/ ISO 9001:2000	Civil construction	19	2.17
5.	M/s Bhgheeratha Electricals and Structural	Private/ ISO 9001:2000.	Electrical contractors	23	2.62
6.	Vikram Sarabhai Space Centre(VSSC), Trivandrum	Central Govt./ ISO 9001:2000	Aerospace Hardwares	108	12.31
7.	Mix. Excel Glasses, Alleppey	Pvt/ ISO 9001:2000	Glass wares	64	7.30
8.	M/s. Rubco, Kottayam	State Govt/ ISO 9001:2000	Rubberised products	40	4.56
9.	M/s Samudra Shipyard Aroor, Alleppy	Pprivate / ISO 9001:2000	Sea vessels	20	2.28
10.	M/s. Samson Chemical Industries, Kottayam	Private /ISO 9001:2000	Manufacturing copper sulphate	24	2.74
11.	M/s Contour Construction company, kochi.	Private/ NO ISO 9001:2000	Civil construction	17	1.94

12.	M/s Contour Ready mix, Kochi	Private/ NO ISO 9001:2000	Ready mix concrete	19	2.17
13.	M/s Cyber Cable Pvt. Limited, Ettumanoor	Private/ NO ISO 9001:2000	Manufacture of house wiring cables	19	2.17
14.	M/s Dolphin Rubber Industries, Kottayam	Private / ISO 9001:2000	Manufacture of floor mats	40	4.56
15.	M/s. Ria Trading Company, Kottayam	Private/ NO ISO 9001:2000	Job works	22	2.51
16.	M/s Mascot Mats, Kottayam	Private/ NO ISO 9001:2000	Manufacturing/ Assembly/ Trading of rubber products	19	2.17
17.	M/s Thalika Parambil Polymers, Kottayam	Private/ NO ISO 9001:2000	Manufacturing rubber mats	20	2.28
18.	M/s Perincheril Rubbers, Kottayam	Private /ISO 9001:2000	Manufacturing. tyres & flaps	15	1.71
19.	M/s Avinash Rubbers, Kottayam	Private/ NO ISO 9001:2000	Manufacture of flaps and mats	16	1.82
20.	M/s Glass & Glace Systems, Trivandrum	Private/ NO ISO 9001:2000	Glass wares	19	2.17
21.	M/s. Geefab Architectural Aluminium, Trivandrum	Private/ NO ISO 9001:2000	Aluminium hard wares	19	2.17
22.	M/s. Meta coats Aluminium Trivandrum	Private/ NO ISO 9001:2000	Aluminium hardwares	19	2.17
23.	IISU/Indian Space Research Organization (ISRO) Trivandrum	CentralGovt/NO ISO 9001:2000	Hard wares for inertial systems	146	16.65
24.	Control & Guidance Unit (ISRO), Trivandrum	Central Govt/ NO ISO 9001:2000	Hard wares for guidance systems	92	10.49
<b>Total</b>				<b>877</b>	<b>100</b>

The sample has twelve organisations each which are certified for ISO 9001: 2000 standard and which are not certified to this quality standard. The responses for the queries raised from 877 employees of different cadres from

both categories of organizations, were approved for completeness and correctness. Out of this, 444 respondents hail from ISO 9001:2000-certified organisations and the rest 433 belong to the other category. The details of the organisations and the respective sample size are mentioned in Table: 1.

Secondary data were collected from papers published in various national and international journals, reports presented by experts on quality management practices and research articles related to the study and the PhD thesis by previous researchers.

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**QUESTIONNAIRE FOR RESEARCH ON QUALITY MANAGEMENT**


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(All the information given shall be kept strictly confidential)

Note: Mark x, where ever it is applicable

Sl.No	Question	strongly agree	weakly agree	undecided	weakly disagree	strongly disagree
1	We are associated with establishing individual and team objectives					
2	Our innovative efforts are encouraged					
3	We know the current level of customer complaints					
4	We are a part of the team, which manages process performance and evaluates the results					
5	Pooling of expertise and resources helps to tackle variety and complexity of problems					
6	Top management identifies the product realization processes which add value					
7	The employees are recognized and appreciated for the good work done					
8	The employees are reprimanded when the results are not satisfactory					
9	There is a self improvement programme in our department					
10	We participate in the process improvements related to quality up gradation					
11	The processes of the organisation are continually improved to enhance the effectiveness & efficiency					

12	The improvements are overviewed and validated					
13	All the members in our unit are involved in the objective setting and decision making process					
14	Quality objectives are established by the top management					
15	We know the current and future needs of the customer					
16	Listening to the voice of the customer helps to optimise the features of the product					
17	Monitoring and measuring the feedback of information on Customer Satisfaction , helps to understand future needs					
18	We are encouraged to communicate the feedback on the obstacles, we face in achieving improvement goals					
19	Communication on the effectiveness of quality management system takes place across the organization					
20	The improvements made and the failures occurring are systematically documented with the same vigour					
21	There is a team effort to carry out cause and effect analysis					
22	Shared vision guides to take decisions on technical matters					
23	We are aware of the cost of quality					
24	Trained resources are made available to meet the needs					
25	We have an effective & efficient process of communicating objectives and accomplishments					

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## LIST OF PUBLICATIONS

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1. Kartha N. R. U. K., and Jagathy Raj V. P., (2007), Impact of Quality on Ethics and Social Responsibility in Marketing, in Industries in Kerala in the present Indian Scenario, proceedings of International Marketing and Society, Held at IIM Kozhikode during April 8-10,pp75-78
2. Kartha N. R. U. K., and Jagathy Raj V. P., (2006), Improvement of Quality in Higher Education in India Through the Mantra of TOTAL Quality Management, proceedings of International Education Meet '06 held at Kochi, February 4-7
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4. Kartha N. R. U. K., and Jagathy Raj V. P., (2004), How to Make Total Quality Management Successful, Proceedings of 2<sup>nd</sup> International Conference on Logistics and Supply Chain Management at PSG College of Technology, Coimbatore, August 8-10.

