

IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT

(An Empirical Study of Nepalese Manufacturing Firms)

A THESIS

Submitted By:

MANOJ KUMAR K.C.

Shanker Dev Campus

Campus Roll No: 575/062

T.U. Regd. No: 10318-95

Submitted To:

Office of the Dean

Faculty of Management

Tribhuvan University

In partial fulfillment of the requirement for the Degree of
Master of Business Studies (MBS)

Kathmandu, Nepal

July, 2011

RECOMMENDATION

This is to certify that the thesis

Submitted By:

MANOJ KUMAR K.C.

Entitled:

IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT

(An Empirical Study of Nepalese Manufacturing Firms)

Has been prepared and approved by this department in the prescribed format of Faculty of Management. This thesis is forwarded for examination.

.....
Prof. Dr. Kamal Das Manandhar
(Thesis Supervisor)

.....
Prof. Bisheshwor Man Shrestha
(Head, Research Department)

.....
Prof. Dr. Kamal Deep Dhakal
(Campus Chief)

VIVA-VOCE SHEET

We have conducted the Viva-Voce examination of the thesis presented

Submitted By

MANOJ KUMAR K.C.

Entitled:

IMPLEMENTATION OF TOTAL QUALITY MANAGEMENT

(An Empirical Study of Nepalese Manufacturing Firms)

And found the thesis to be original work of the student and written in accordance to the prescribed format. We recommend the thesis to be accepted as partial fulfillment of the requirements for

Master Degree of Business Studies (M.B.S)

Viva-Voce Committee:

Head, Research Department :.....

Member (Thesis Supervisor) :.....

Member (External Expert) :.....

DECLARATION

I hereby declare that the work reported in this thesis entitled “Implementation of Total Quality Management (An Empirical Study of Nepalese Manufacturing Firms)” submitted to Shanker Dev Campus, Faculty of Management, Tribhuvan University, is my original work done in the form of partial fulfillment of requirement for the Master’s Degree in Business Studies (M.B.S) under the supervision of Prof. Dr. Kamal Das Manandhar of Shanker Dev Campus.

.....

MANOJ KUMAR K.C.

Researcher

Campus Roll No: 575/062

T.U. Regd. No: 10318-95

ACKNOWLEDGEMENT

I express my sincere gratitude to all the authors and learned personalities, whose writings have been cited in this study. I also express my sincere gratitude to those authors whose writings though are not cited but helped and inspired me in making my vision clear and reaching on conclusion.

I extend my deep sense of indebtedness to my respected supervisor Prof. Dr. Kamal Das Manandhar for his precious guidelines, inspiration and suggestion thoroughly during the period of this research. Without his valuable insight, I would not think of accomplishment of this thesis. I acknowledge my profound gratitude to the personnel of Hulas Motors Pvt. Ltd. for the cooperation shown and providing necessary data.

I want to give thanks for the staff members of T.U. Central Library, Shanker Dev Campus Library who provided the reference and reading materials during the period of research.

Finally, I would like to express my sincere gratitude to Mr. Prakash Poudel (Country Manager of URS Nepal) all my family members, all my friends for their assistance, timely encouragement in every step.

Thank you.

MANOJ KUMAR K.C.

Researcher

TABLE OF CONTENTS

	PAGE NO.
CHAPTER-1: INTRODUCTION	1-4
1.1 Background	1
1.2 Effects of TQM Implementation	1
1.3 Research Objectives	3
1.4 Significance of the Study	3
1.5 Research Questions	3
1.6 Organization of the Study	4
CHAPTER 2: REVIEW OF LITERATURE	5-48
2.1 Introduction	5
2.2 Concept from Quality Gurus	5
2.2.1 Deming's Approach to TQM	5
2.2.2 Juran's Approach to TQM	7
2.2.3 Crosby's Approach to TQM	9
2.2.4 Feigenbaum's Approach to TQM	11
2.2.5 Ishikawa's Approach to TQM	12
2.2.6 Results from Quality Gurus	13
2.3 Review of Quality Award Models	14
2.3.1 The Deming Prize	14
2.3.2 The European Model for TQM	21
2.3.3 The Malcolm Baldrige National Quality Award	22
2.3.4 Results from Quality Awards	24
2.4 Review of Other Research	24
2.5 TQM Concept in this Study	27
2.5.1 Definition of TQM	27
2.5.2 TQM Constructs	29
2.6 Summary	48
CHAPTER 3: RESEARCH METHODOLOGY	49-50
3.1 Introduction	49
3.2 Research Design	49

3.2.1	Research Strategies	49
3.2.2	Research Sample	50
3.2.3	Data Analysis	50

CHAPTER IV: DATA PRESENTATION AND ANALYSIS 51-79

4.1	Introduction	51
4.2	A Brief Introduction of the Firm	51
4.3	Evaluation of TQM Implementation and Overall Business Performance	52
4.3.1	TQM Implementation	52
4.3.2	Overall Business Performance	65
4.4	Four Categories of Improvement Possibilities	68
4.5	Formulation of Improvement Plan	72
4.6	Major Findings	78

CHAPTER V: SUMMARY, CONCLUSIONS AND RECOMMENDATION

80-83

5.1	Summary	80
5.2	Conclusions	82
5.3	Recommendations	83

BIBLIOGRAPHY

APPENDIX

LIST OF TABLE

TABLE NO.	TITLE	PAGE NO.
Table 2.1	Universal Processes for Managing Quality	9
Table 2.2	Conceptual Framework Comparison	28

LIST OF FIGURE

FIGURE NO.	TITLE	PAGE NO.
Figure No. 2.1	A Decomposition Model of TQM Implementation	29
Figure No. 4.1	Workshop Structure	52
Figure No. 4.2	Leadership	53
Figure No. 4.3	Supplier Quality Management	54
Figure No. 4.4	Vision and Plan Statement	55
Figure No. 4.5	Evaluation	56
Figure No. 4.6	Process Control and Improvement	58
Figure No. 4.7	Product Design	59
Figure No. 4.8	Quality System Improvement	60
Figure No. 4.9	Employee Participation	61
Figure No. 4.10	Recognition and Reward	62
Figure No. 4.11	Education and Training	63
Figure No. 4.12	Customer Focus	64
Figure No. 4.13	Three Programs of the Improvement Plan	74

ABBREVIATIONS

AD	:	Anno Domini
B.S	:	Bikram Sambat
ACSI	:	The American Customer Satisfaction Index
CAD	:	Computer-aided Design
CSB	:	The Customer Satisfaction Barometer
GFI	:	Goodness-of-fit Index
GLS	:	Generalized Least Squares
ISO	:	International Organization for Standardization
ISO 9000	:	ISO 9000 Series Standards include three Basic Standards (ISO 9001, ISO 9002, and ISO 9003), which can be used in Third Party Certification of Quality Management Systems.
JDI	:	The Job Descriptive Index
JDS	:	The Job Diagnostic Survey
JIG	:	The Job in General Scale
JSS	:	The Job Satisfaction Survey
MBS	:	Master of Business Studies
ML	:	Maximum Likelihood
MOAQ	:	The Michigan Organization Assessment Questionnaire Subscale
MSQ	:	The Minnesota Satisfaction Questionnaire
PDCA	:	Plan, Do, Check, and Act.
QC	:	Quality Control
QFD	:	Quality Function Deployment
R&D	:	Research and Development
SPC	:	Statistical Process Control
TU	:	Tribhuvan University
TQM	:	Total Quality Management

CHAPTER-1

INTRODUCTION

1.1 Background

Over the past few decades, quality gurus such as Deming (1986), Juran (Juran and Gryna, 1993), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985), the primary researchers of total quality management (TQM), have developed certain propositions in the field of TQM, which have gained significant acceptance throughout the world. Their insights provide a good understanding of the TQM philosophy, principles, and practices. After careful study of their work, it has been found that these quality gurus have different views about TQM, although some similarities can be found. Worldwide, there are several Quality Awards such as the Deming Prize (1996) in Japan, the European Quality Award (1994) in Europe, and the Malcolm Baldrige National Quality Award (1999) in the United States of America. Each award model is based on a perceived model of TQM. However, the three award models are different from each other and each has its own characteristics.

In the field of TQM implementation, much research has already been conducted, different researchers adopting different definitions of TQM. The concept is still a subject of debate (Easton and Jarrell, 1998), still a hazy and ambiguous concept (Dean and Bowen, 1994). So far, TQM has come to mean different things to different people (Hackman and Wageman, 1995).

1.2 Effects of TQM Implementation

TQM has been widely implemented throughout the world. Many firms have arrived at the conclusion that effective TQM implementation can improve their competitive abilities and provide strategic advantages in the marketplace (Anderson et al., 1994a). Several studies have shown that the adoption of TQM practices can allow firms to compete globally (e.g., Easton, 1993; Handfield, 1993; Hendricks and Singhal, 1996, 1997; Womack et al., 1990; American Quality Foundation and Ernst & Young, 1991). Several researchers also reported that TQM implementation has led to improvements in quality, productivity, and competitiveness in only 20-30% of the firms that have implemented it (Benson, 1993; Schonberger, 1992). A study conducted by Rategan (1992) indicated that a 90%

improvement rate in employee relations, operating procedures, customer satisfaction, and financial performance is achieved due to TQM implementation. However, Burrows (1992) reported a 95% failure rate for initiated TQM implementation programs; Eskildson (1994) and Tornow and Wiley (1991) reported that TQM implementation has uncertain or even negative effects on performance. Longenecker and Scazzero (1993) indicated that achieving high product quality and pursuing successful TQM implementation are highly dependent on top management support.

However, Motwani et al. (1994) reported that there is no association between top management support for quality and the level of product quality achieved. Many researchers suggested that effective product design can lead to the improvement of product quality (e.g., Gitlow et al., 1989; Juran and Gryna, 1993), whereas Motwani et al. (1994) reported that there is no relationship between systematic product design and the level of product achieved. Recently, Rungtusanatham et al. (1998) attempted to replicate, as closely as possible, empirical evaluation of a Deming-based theory of quality management conducted by Anderson et al. (1995). In their replication study, they used data obtained from three different Italian industries to compare with the reported results in Anderson et al. (1995), which used data from US-based firms. It was interesting to find that the research results between the two studies differed considerably. Thus, conflicting research findings have been reported surrounding the effects of TQM implementation on overall business performance.

These seemingly conflicting results were also found in Nepalese manufacturing firms. In order to encourage firms in implementing TQM, great efforts have been made by the Nepalese government. As a result, an increasing number of firms implemented TQM; in a survey conducted by Yu et al. (1998), 96% of responding firms reported that they had done so. Therefore, it can be said that the rate of TQM implementation is very high in Nepalese manufacturing firms. However, Yu et al. (1998) also stated that the effectiveness of the deployment of TQM in Nepalese firms is still puzzling. As to how effective the implementation truly is, that may be another story. According to Zhao et al. (1995), Nepal still lacks effective TQM systems and application at the firm level. Some basic quality principles and modern quality management methods have not been widely used by Nepalese manufacturing firms. Based on the results of the state supervision and inspection of product

quality, it can be concluded that Nepal's product quality as a whole is still at a relatively low level.

What is TQM implementation really going on in Nepalese manufacturing firms? The existing literature has shown that no large-scale empirical research has been systematically conducted dealing with TQM practices and their effects on overall business performance in Nepalese manufacturing firms. In order to bridge this gap, an investigation into the effects of TQM implementation in Nepalese manufacturing firms is truly needed. Such a study can explore the degree of the impact of TQM implementation on overall business performance in firms and help in identifying problem areas and possible remedies.

1.3 Research Objectives

Based on the current TQM implementation in Nepalese manufacturing firms, this research aims at achieving the following research objectives:

-) To obtain the effects of TQM implementation on overall business performance in Nepalese manufacturing firms;
-) To obtain a TQM implementation model for Nepalese manufacturing firms.

1.4 Significance of the Study

In this research, new knowledge is generated from existing TQM knowledge integrated with specific characteristics of Nepalese manufacturing firms. After reviewing the existing TQM literature, it has become very clear that this research project is the only one that systematically examines the effects of TQM implementation in Nepalese manufacturing firms. In addition, this research attempts to develop a TQM implementation model that can be used by Nepalese manufacturing firms. Thus, new knowledge related to TQM implementation in Nepalese manufacturing firms can be derived.

1.5 Research Questions

Based on the research objectives, the extensive literature review, brainstorming sessions with the researcher's promoters, and informal talks with quality practitioners, five research questions have been proposed. They are listed as follows:

Question 1: What is TQM?

Question 2: What is overall business performance within TQM?

Question 3: What are the effects of TQM implementation on overall business performance in Nepalese manufacturing firms?

Question 4: What kind of TQM implementation model should be developed in order to guide Nepalese manufacturing firms in implementing TQM?

Question 5: How can this TQM implementation model be demonstrated in practice?

1.6 Organization of the Study

This study has been organized into five Chapters.

Chapter I [Introduction]

Chapter I introduces the background, objectives, significance, limitations, research question and organization of the study.

Chapter II [Literature Review]

This Chapter is the brief review of literature related to this study. It includes a discussion on the conceptual framework and review of the major studies. It gives an overview of the related literature done in the past related to this study.

Chapter III [Research Methodology]

Chapter III, Research Methodology, describes the different methodologies employed in this study. Sources of data are mentioned and described in this chapter.

Chapter IV [Presentation and Analysis of Data]

This Chapter presents and analyzes the data obtained during the study. Different tools and techniques of data analysis have been undertaken for the purpose of analysis of data.

Chapter V [Summary, Conclusion and Recommendations]

This chapter includes the summary, conclusion and the recommendations of the study. The findings are included in this chapter along with the suggestions and their recommendations.

The **Bibliography and Appendices** have been given at the end of the study.

CHAPTER 2

REVIEW OF LITERATURE

2.1 Introduction

This chapter focuses on the identification of the concept of TQM on the basis of the literature review. Section 2.2 presents the concept of TQM from quality gurus. Section 2.3 describes the three well recognized quality award models. Section 2.4 discusses the TQM concept from a number of researchers in the field of TQM. Section 2.5 presents the TQM concept adopted in this study and the detailed explanations of the 11 TQM implementation constructs. Finally, section 2.6 summarizes this chapter.

2.2 Concept from Quality Gurus

An extensive review of literature was carried out to identify the concept of TQM from quality gurus such as Deming (1986), Juran (Juran and Gryna, 1993), Crosby (1979), Feigenbaum (1991), and Ishikawa (1985). Their propositions are the foundation for understanding the concept of TQM. The following subsections present the main principles and practices of TQM proposed by these quality gurus.

2.2.1 Deming's Approach to TQM

The theoretical essence of the Deming approach to TQM concerns the creation of an organizational system that fosters cooperation and learning for facilitating the implementation of process management practices, which, in turn, leads to continuous improvement of processes, products, and services as well as to employee fulfillment, both of which are critical to customer satisfaction, and ultimately, to firm survival (Anderson et al., 1994a). Deming (1986) stressed the responsibilities of top management to take the lead in changing processes and systems. Leadership plays in ensuring the success of quality management, because it is the top management's responsibility to create and communicate a vision to move the firm toward continuous improvement. Top management is responsible for most quality problems; it should give employees clear standards for what is considered acceptable work, and provide the methods to achieve it. These methods include an appropriate working environment and climate for work-free of faultfinding, blame or fear. Deming (1986) also emphasized the importance of identification and measurement of

customer requirements, creation of supplier partnership, use of functional teams to identify and solve quality problems, enhancement of employee skills, participation of employees, and pursuit of continuous improvement. Anderson et al. (1994a) developed a theory of quality management underlying the Deming management method. They proposed that: The effectiveness of the Deming management method arises from leadership efforts toward the simultaneous creation of a cooperative and learning organization to facilitate the implementation of process-management practices, which, when implemented, support customer satisfaction and organizational survival through sustained employee fulfillment and continuous improvement of processes, products, and services.

The means to improve quality lie in the ability to control and manage systems and processes properly, and in the role of management responsibilities in achieving this. Deming (1986) advocated methodological practices, including the use of specific tools and statistical methods in the design, management, and improvement of process, which aim to reduce the inevitable variation that occurs from “common causes” and “special causes” in production. “Common causes” of variations are systemic and are shared by many operators, machines, or products. They include poor product design, non-conforming incoming materials, and poor working conditions. These are the responsibilities of management. “Special causes” relate to the lack of knowledge or skill, or poor performance. These are the responsibilities of employees. Deming proposed 14 points as the principles of TQM (Deming, 1986), which are listed below:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and to stay in business, and to provide jobs.
2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.
3. Cease dependence on mass inspection to quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.
4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move toward a single supplier for any one item, on a long-term relationship of loyalty and trust.

5. Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.
6. Institute training on the job.
7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.
8. Drive out fear, so that people may work effectively for the company.
9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use they may be encountered with the product or service.
10. Eliminate slogans, exhortations, and targets for the workforce asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the workforce.
11. a) Eliminate work standards (quotas) on the factory floor. Substitute leadership.
b) Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.
12. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality. (b) Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objective.
13. Institute a vigorous program of education and self-improvement.
14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

2.2.2 Juran's Approach to TQM

TQM is the system of activities directed at achieving delighted customers, empowered employees, higher revenues, and lower costs (Juran and Gryna, 1993). Juran believed that main quality problems are due to management rather than workers. The attainment of quality requires activities in all functions of a firm. Firm-wide assessment of quality, supplier quality management, using statistical methods, quality information system, and

competitive benchmarking are essential to quality improvement. Juran's approach is emphasis on team (QC circles and self-managing teams) and project work, which can promote quality improvement, improve communication between management and employees coordination, and improve coordination between employees. He also emphasized the importance of top management commitment and empowerment, participation, recognition and rewards.

According to Juran, it is very important to understand customer needs. This requirement applies to all involved in marketing, design, manufacture, and services. Identifying customer needs requires more vigorous analysis and understanding to ensure the product meets customers' needs and is fit for its intended use, not just meeting product specifications. Thus, market research is essential for identifying customers' needs. In order to ensure design quality, he proposed the use of techniques including quality function deployment, experimental design, reliability engineering and concurrent engineering. control, quality improvement, and quality planning. In his view, the approach to managing for quality consists of: The sporadic problem is detected and acted upon by the process of quality control; The chronic problem requires a different process, namely, quality improvement; Such chronic problems are traceable to an inadequate quality planning process. Juran defined a universal sequence of activities for the three quality processes, which is listed in Table 2.1.

Juran defined four broad categories of quality costs, which can be used to evaluate the firm's costs related to quality. Such information is valuable to quality improvement. The four quality costs are listed as follows:

- Internal failure costs (scrap, rework, failure analysis, etc.), associated with defects found prior to transfer of the product to the customer;
- External failure costs (warranty charges, complaint adjustment, returned material, allowances, etc.), associated with defects found after product is shipped to the customer;
- Appraisal costs (incoming, in-process, and final inspection and testing, product quality audits, maintaining accuracy of testing equipment, etc.), incurred in determining the degree of conformance to quality requirements;

- Prevention costs (quality planning, new product review, quality audits, supplier quality evaluation, training, etc.), incurred in keeping failure and appraisal costs to a minimum.

Table 2.1
Universal Processes for Managing Quality

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	Organize project teams
Develop product features	Create a sensor	Diagnose the causes
Develop process features	Measure actual performance	Provide remedies, prove remedies are effective
Establish process controls, transfer to operations.	Interpret the difference	Deal with resistance to change
	Take action on the difference	Control to hold the gains

2.2.3 Crosby’s Approach to TQM

Crosby (1979) identified a number of important principles and practices for a successful quality improvement program, which include, for example, 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 claimed 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 excellence (zero defects) and attention to detail will cure the second. Crosby also stressed the importance of management style to successful quality improvement. The key to quality improvement is to change the thinking of top managers-to get them not to accept mistakes and defects, as this would in turn reduce work expectations and standards in their jobs. Understanding, commitment, and communication are all essential. Crosby presented the quality management maturity grid, which can be used by firms to evaluate their quality management maturity. The five stages are: Uncertainty, awakening, enlightenment, wisdom

and certainty. These stages can be used to assess progress in a number of measurement categories such as management understanding and attitude, quality organization status, problem handling, cost of quality as percentage of sales, and summation of firm quality posture. The quality management maturity grid and cost of quality measures are the main tools for managers to evaluate their quality status. Crosby offered a 14-step program that can guide firms in pursuing quality improvement. These steps are listed as follows:

1. Management commitment: To make it clear where management stands on quality.
2. Quality improvement team: To run the quality improvement program.
3. Quality measurement: To provide a display of current and potential nonconformance problems in a manner that permits objective evaluation and corrective action.
4. Cost of quality: To define the ingredients of the cost of quality, and explain its use as a management tool.
5. Quality awareness: To provide a method of raising the personal concern felt by all personnel in the company toward the conformance of the product or service and the quality reputation of the company.
6. Corrective action: To provide a systematic method of resolving forever the problems that is identical through previous action steps.
7. Zero defects planning: To investigate the various activities that must be conducted in preparation for formally launching the Zero Defects program.
8. Supervisor training: To define the type of training that supervisor need in order to actively carry out their part of the quality improvement program.
9. Zero defects day: To create an event that will make all employees realize, through a personal experience, that there has been a change.
10. Goal setting: To turn pledges and commitment into actions by encouraging individuals to establish improvement goals for themselves and their groups.
11. Error causal removal: To give the individual employee a method of communicating to management the situation that makes it difficult for the employee to meet the pledge to improve.
12. Recognition: To appreciate those who participate.
13. Quality councils: To bring together the professional quality people for planned communication on a regular basis.

14. Do it over again: To emphasize that the quality improvement program never ends.

2.2.4 Feigenbaum's Approach to TQM

Feigenbaum (1991) defined TQM5 as: An effective system for integrating the quality development, quality-maintenance, and quality-improvement efforts of the various groups in a firm so as to enable marketing, engineering, production, and service at the most economical levels which allow for full customer satisfaction. He claimed that effective quality management consists of four main stages, described as follows:

- Setting quality standards;
- Appraising conformance to these standards;
- Acting when standards are not met;
- Planning for improvement in these standards.

The quality chain, he argued, starts with the identification of all customers' requirements and ends only when the product or service is delivered to the customer, who remains satisfied. Thus, all functional activities, such as marketing, design, purchasing, manufacturing, inspection, shipping, installation and service, etc., are involved in and influence the attainment of quality. Identifying customers' requirements is a fundamental initial point for achieving quality. He claimed that effective TQM requires a high degree of effective functional integration among people, machines, and information, stressing a system approach to quality. A clearly defined total quality system is a powerful foundation for TQM. Total quality system is defined as follows:

The agreed firm-wide operating work structure, documented in effective, integrated technical and managerial procedures, for guiding the coordinated actions of the people, the machines, and the information of the firm in the best and most practical ways to assure customer quality satisfaction and economical costs of quality.

Feigenbaum emphasized that efforts should be made toward the prevention of poor quality rather than detecting it after the event. He argued that quality is an integral part of the day-to-day work of the line, staff, and operatives of a firm. There are two factors affecting product quality: The technological-that is, machines, materials, and processes; and the

human—that is, operators, foremen, and other firm personnel. Of these two factors, the human is of greater importance by far. Feigenbaum considered top management commitment, employee participation, supplier quality management, information system, evaluation, communication, use of quality costs, use of statistical technology to be an essential component of TQM. He argued that employees should be rewarded for their quality improvement suggestions, quality is everybody's job. He stated that effective employee training and education should focus on the following three main aspects: Quality attitudes, quality knowledge, and quality skills.

2.2.5 Ishikawa's Approach to TQM

Ishikawa (1985) argued that quality management extends beyond the product and encompasses after-sales service, the quality of management, the quality of individuals and the firm itself. He claimed that the success of a firm is highly dependent on treating quality improvement as a never-ending quest. A commitment to continuous improvement can ensure that people will never stop learning. He advocated employee participation as the key to the successful implementation of TQM. Quality circles, he believed, are an important vehicle to achieve this. Like all other gurus he emphasized the importance of education, stating that quality begins and ends with it. He has been associated with the development and advocacy of universal education in the seven QC tools (Ishikawa, 1985). These tools are listed below:

- ✓ Pareto chart;
- ✓ Cause and effect diagram (Ishikawa diagram)
- ✓ Stratification chart
- ✓ Scatter diagram;
- ✓ Check sheet;
- ✓ Histogram;
- ✓ Control chart.

Ishikawa (1985) suggested that the assessment of customer requirements serves as a tool to foster cross-functional cooperation; selecting suppliers should be on the basis of quality rather than solely on price; cross-functional teams are effective ways for identifying and

solving quality problems. Ishikawa's concept of TQM contains the following six fundamental principles:

- ✓ Quality first-not short-term profits first;
- ✓ Customer orientation-not producer orientation;
- ✓ The next step is your customer-breaking down the barrier of sectionalism;
- ✓ Using facts and data to make presentations-utilization of statistical methods;
- ✓ Respect for humanity as a management philosophy, full participatory management;
- ✓ Cross-functional management.

2.2.6 Results from Quality Gurus

After the approaches to TQM of the five quality gurus have been reviewed, it has become evident that each has his own distinctive approach. Nevertheless, the principles and practices of TQM proposed by these quality gurus do provide the researcher with a better understanding of the concept of TQM. Their insights offer a solid foundation for conducting this study. Although their approaches to TQM are not totally the same, they do share some common points which are summarized as follows:

1. It is management's responsibility to provide commitment, leadership, empowerment, encouragement, and the appropriate support to technical and human processes. It is top management's responsibility to determine the environment and framework of operations within a firm. It is imperative that management foster the participation of the employees in quality improvement, and develops a quality culture by changing perception and attitudes toward quality.
2. The strategy, policy, and firm-wide evaluation activities are emphasized.
3. The importance of employee education and training is emphasized in changing employees' beliefs, behavior, and attitudes; enhancing employees' abilities in carrying out their duties.
4. Employees should be recognized and rewarded for their quality improvement efforts.
5. It is very important to control the processes and improve quality system and product design. The emphasis is on prevention of product defects, not inspection after the event.

6. Quality is a systematic firm-wide activity from suppliers to customers. All functional activities, such as marketing, design, engineering, purchasing, manufacturing, inspection, shipping, accounting, installation and service, should be involved in quality improvement efforts.

2.3 Review of Quality Award Models

Worldwide, there are several Quality Awards, such as the Deming Prize in Japan (1996), the European Quality Award in Europe (1994), and the Malcolm Baldrige National Quality Award in the United States of America (1999). The broad aims of these awards are described as follows (Ghobadian and Woo, 1996):

- ✓ Increase awareness of TQM because of its important contribution to superior competitiveness;
- ✓ Encourage systematic self-assessment against established criteria and market awareness simultaneously;
- ✓ Stimulate sharing and dissemination of information on successfully deployed quality strategies and on benefits derived from implementing these strategies;
- ✓ Promote understanding of the requirements for the attainment of quality excellence and successful deployment of TQM;
- ✓ Encourage firms to introduce a continuous improvement process.

Each award model is based on a perceived model of TQM. The award models do not focus solely on either product or service perfection or traditional quality management methods, but consider a wide range of management activities, behavior and processes that influence the quality of the final offerings. They provide a useful audit framework against which firms can evaluate their TQM implementation practices, seek improvement opportunities, and the end results.

2.3.1 The Deming Prize

The Deming Prize was established by the Board of Directors of the Japanese Union of Scientists and Engineers in 1951. Its main purpose is to spread the quality gospel by recognizing performance improvements flowing from the successful implementation of

firm-wide quality control based on statistical quality control techniques (Ghobadian and Woo, 1996).

The Deming Prize proved an effective instrument for spreading TQM philosophy throughout the Japanese industries. There are ten primary elements in the Deming Application Prize (1996), as well as a checklist that is used to evaluate the performance of senior executives. This checklist emphasizes the importance of top management's active participation in quality management activities and understanding of the main requirements of quality improvement programs. It also provides senior executives with a list of what they need to do. The primary elements in the Deming Application Prize and the checklist used to evaluate senior executives are listed below:

1. Policies

- ✓ Quality and quality control policies and their place in overall business management;
- ✓ Clarity of policies (targets and priority measures);
- ✓ Methods and processes for establishing policies;
- ✓ Relationship of policies to long- and short-term plans;
- ✓ Communication (deployment) of policies, and grasp and management of achieving policies;
- ✓ Executives' and managers' leadership.

2. Organization

- ✓ Appropriateness of the organizational structure for quality control and status of employee involvement;
- ✓ Clarity of responsibility and responsibility;
- ✓ Status of interdepartmental coordination;
- ✓ Status of committee and project team activities
- ✓ Status of staff activities;
- ✓ Relationships with associated companies (group companies, vendors, contractors, sales companies, etc.).

3. Information

- ✓ Appropriateness of collecting and communicating external information;

- ✓ Appropriateness of collecting and communicating internal information;
 - ✓ Status of applying statistical techniques to data analysis;
 - ✓ Appropriateness of information retention;
 - ✓ Status of utilizing information;
 - ✓ Status of utilizing computers for data processing.
4. Standardization
- ✓ Appropriateness of the system of standards;
 - ✓ Procedures for establishing, revising and abolishing standards;
 - ✓ Actual performance in establishing, revising and abolishing standards;
 - ✓ Contents of standards;
 - ✓ Status of utilizing and adhering to standards;
 - ✓ Status of systematically developing, accumulating, handing down and utilizing technologies.
5. Human resources
- ✓ Education and training plans and their development and results utilization;
 - ✓ Status of quality consciousness, consciousness of managing jobs, and understanding of quality control;
 - ✓ Status of supporting and motivating self-development and self-realization;
 - ✓ Status of understanding and utilizing statistical concepts and methods;
 - ✓ Status of QC circle development and improvement suggestions;
 - ✓ Status of supporting the development of human resources in associated companies.
6. Quality assurance
- ✓ Status of managing the quality assurance activities system;
 - ✓ Status of quality control diagnosis;
 - ✓ Status of new product and technology development (including quality analysis, quality deployment and design review activities);
 - ✓ Status of process control;
 - ✓ Status of process analysis and process improvement (including process capability studies);
 - ✓ Status of inspection, quality evaluation and quality audit;

- ✓ Status of managing production equipment, measuring instruments and vendors;
- ✓ Status of packaging, storage, transportation, sales and service activities;
- ✓ Grasping and responding to product usage, disposal, recovery and recycling;
- ✓ Status of quality assurance;
- ✓ Grasping of the status of customer satisfaction;
- ✓ Status of assuring reliability, safety, product liability and environmental protection.

7. Maintenance

- ✓ Rotation of management (PDCA) cycle control activities;
- ✓ Methods for determining control items and their levels;
- ✓ In-control situations (status of utilizing control charts and other tools);
- ✓ Status of taking temporary and permanent measures;
- ✓ Status of operating management systems for cost, quantity, delivery, etc.;
- ✓ Relationship of quality assurance system to other operating management systems.

8. Improvement

- ✓ Methods of selecting themes (important activities, problems and priority issues);
- ✓ Linkage of analytical methods and intrinsic technology;
- ✓ Status of utilizing statistical methods for analysis;
- ✓ Utilization of analysis results;
- ✓ Status of confirming improvement results and transferring them to maintenance/control/activities;
- ✓ Contribution of QC circle activities.

9. Effects

- ✓ Tangible effects (such as quality, delivery, cost, profit, safety and environment);
- ✓ Intangible effects;
- ✓ Methods for measuring and grasping effects;
- ✓ Customer satisfaction and employee satisfaction;
- ✓ Influence on associated companies
- ✓ Influence on local and international communities.

10. Future plans

- ✓ Status of grasping current situations;
- ✓ Future plans for improving problems;
- ✓ Projection of changes in social environment and customer requirements and future plans based on these projected changes;
- ✓ Relationships among management philosophy, vision and long-term plans;
- ✓ Continuity of quality control activities;
- ✓ Concreteness of future plans.

The checklist used to evaluate the performance of senior executives is listed as follows:

1. Understanding

- ✓ Are the objectives of quality control and enthusiasm introduction and promotion clearly defined and well understood?
- ✓ How well do they understand quality control, quality assurance, reliability, product liability, etc.?
- ✓ How well do they understand the importance of the statistical way of thinking and the application of quality control techniques?
- ✓ How well do they understand QC circle activities?
- ✓ How well do they understand the relationship of quality control and the concepts and methods of other management activities?
- ✓ How enthusiastic are they in promoting quality control? How well are they exercising leadership?
- ✓ How well do they understand the status and the characteristics of their company's quality and quality control?

2. Policies

- ✓ How are quality policies and quality control policies established? Where and how do these policies stand in relation to overall business management?
- ✓ How are these policies related to short- and long-term plans?
- ✓ How are these policies deployed throughout the company for their achievement?
- ✓ How do they grasp the status of policy achievement? Are they taking appropriate corrective actions when needed?

- ✓ How do they grasp priority quality issues (priority business issues)? Do they make effective use of diagnostic methods such as top management diagnosis?
- ✓ How well are targets and priority measures aligned with policies?
- ✓ What kind of policies do they employ for establishing cooperative relationships with associated companies?

3. Organization

- ✓ How the company is organized and managed so that human resources can effectively and efficiently practice quality control?
- ✓ How are the researcher ties and responsibilities in the organization established?
- ✓ Is the allocation of human resources suitable for the organization?
- ✓ How do they strive to make employees happy and satisfied?
- ✓ How do they grasp and evaluate employees' capability and motivation levels?
- ✓ How do they strive for interdepartmental cooperation? How do they utilize committees and project teams?
- ✓ How do they relate to associated companies?

4. Human resources

- ✓ How clear is the philosophy for hiring, developing and utilizing human resources?
- ✓ How appropriate are the employee education and training plans? Are the necessary budget and time allocated?
- ✓ How do they communicate the policies for quality control education and training and how do they grasp the status achieving their policies?
- ✓ How do they provide education and training specific to the company's business needs?
- ✓ How well do they understand the importance of employee self- and mutual development?
- ✓ How do they support this effort?
- ✓ How do they strive to develop QC circle activities?
- ✓ How interested are they in developing human resources in associated companies?

5. Implementation

- ✓ What kind of measures do they have for the evaluation, and effective and efficient implementation, of quality control?
- ✓ How well is the overall coordination of quality control and other management systems?
- ✓ How do they grasp the status of improvement in the business processes and the individual steps of these processes so as to provide products and services that satisfy the customer needs? Are they taking necessary corrective actions?
- ✓ How well are the systems for developing new products and services, new technologies and new markets established and managed?
- ✓ How well are the necessary resources secured and allocated for establishing and operating management and information systems?
- ✓ How do they grasp the effects and contributions of quality control to the improvement of business performance?
- ✓ How do they evaluate their employees' efforts?

6. Corporate social

- ✓ Is the company structured to ensure appropriate profits for a long time?
- ✓ How well do they regard employee well-being (wage levels, working hours, etc.)?
- ✓ How well do they regard employee self-realization?
- ✓ How well do they strive for co-existence and co-prosperity with associated companies?
- ✓ How well does the company contribute to the local community?
- ✓ How well does the company exert efforts to protect the environment?
- ✓ How well does the company positively impact the international community?

7. Future visions

- ✓ How do they assure the continuity of, and future plans for, quality control?
- ✓ How do they anticipate and cope with changes in surrounding business environment and progress in science and technology?
- ✓ How do they grasp and cope with changes in customer requirements?

- ✓ How do they consider their employees and help them achieve happiness and satisfaction?
- ✓ How do they consider and manage relationships with associated companies?
- ✓ How do they plan for the future to cope with the items above?
- ✓ How do they utilize quality control to achieve the future plans?

2.3.2 The European Model for TQM

The European Quality Award was officially launched in 1991. The primary purpose of the award is to support, encourage, and recognize the development of effective TQM by European firms. The model of the European Quality Award is divided into two parts, Enablers and Results. The enablers are leadership, people management, policy & strategy, resources, and processes. These five aspects steer the business and facilitate the transformation of inputs to outputs. The results are people satisfaction, customer satisfaction, impact on society, and business results (the measure of the level of output attained by the firm). The European Quality Award model (1994) consists of nine primary elements, which are further divided into a number of secondary elements. The primary and secondary elements are listed below:

1. Leadership
 - ✓ Visible involvement in leading total quality;
 - ✓ A consistent total quality culture;
 - ✓ Timely recognition and appreciation of the effects and successes of individuals and teams;
 - ✓ Support of total quality by provision of appropriate resources and assistance;
 - ✓ Involvement with customers and suppliers;
 - ✓ Active promotion of total quality outside the organization.
2. Policy and strategy
 - ✓ How policy and strategy are based on the concept of total quality;
 - ✓ How policy and strategy are formed on the basis of information that is relevant to total quality;
 - ✓ How policy and strategy are the basis of business plans;
 - ✓ How policy and strategy are communicated;

- ✓ How policy and strategy are regularly reviewed and improved.
3. People management
 - ✓ How continuous improvement in people management is accomplished;
 - ✓ How the skills and capabilities of the people are preserved and developed through recruitment, training and career progression;
 - ✓ How people and teams agree on targets and continuously review performance;
 - ✓ How the involvement of everyone in continuous improvement is promoted and people are empowered to take appropriate action;
 - ✓ How effective top-down and bottom-up communication is achieved.
 4. Resources
 - ✓ Financial resources;
 - ✓ Information resources;
 - ✓ Material resources and fixed assets;
 - ✓ The application of technology.
 5. Processes
 - ✓ How processes critical to the success of the business are identified;
 - ✓ How the organization systematically manages its processes;
 - ✓ How process performance measurements, along with all relevant feedback, are used to review processes and to set targets for improvement;
 - ✓ How the organization stimulates innovation and creativity in process improvement;
 - ✓ How the organization implements process changes and evaluates the benefits.
 6. Customer satisfaction.
 7. People satisfaction.
 8. Impact on society.
 9. Business results.

2.3.3 The Malcolm Baldrige National Quality Award

In 1987, the US Union passed the Malcolm Baldrige National Quality Improvement Act, and thus established an annual quality award in the US. The aim of the award is to

encourage American firms to improve quality, satisfy customers, and improve overall firms' performance and capabilities. The model framework can be used to assess firms' current quality management practices, benchmark performance against key competitors and world class standards, and improve relations with suppliers and customers. The Malcolm Baldrige National Quality Award model framework (1999) is listed as follows:

1. Leadership
 - ✓ Organizational leadership;
 - ✓ Public responsibility and citizenship.
2. Strategic planning
 - ✓ Strategy development;
 - ✓ Strategy deployment.
3. Customer and market focus
 - ✓ Customer and market knowledge;
 - ✓ Customer satisfaction and relationships.
4. Information and analysis
 - ✓ Measurement of organizational performance;
 - ✓ Analysis of organizational performance.
5. Human resource focus
 - ✓ Work systems;
 - ✓ Employee education, training, and development;
 - ✓ Employee well-being and satisfaction.
6. Process management
 - ✓ Product and service processes;
 - ✓ Support processes;
 - ✓ Supplier and partnering processes.
7. Business results
 - ✓ Customer focused results;

- ✓ Financial and market results;
- ✓ Human resource results;
- ✓ Supplier and partner results;
- ✓ Organizational effectiveness results.

2.3.4 Results from Quality Awards

The three quality award models provide a universal framework for evaluating aspects of TQM practices in a firm. They also provide a framework for identifying a range of intangible and tangible processes that influence the firm's TQM implementation and the end results. Although each award has its own unique categories and emphasis, there are some common areas.

(1) Each award model has two parts: One is TQM implementation (that is, the enablers); the other is the overall business results. TQM implementation makes overall business results happen.

(2) All three award models emphasize the importance of leadership, human resources management, employee participation, employee education and training, process management, strategy and policy, information, supplier quality management, and customer focus. The three quality award models provide firms with a means to measure their position against a set of universal criteria, and to identify their strengths and weaknesses in the areas of quality management practices and business results. These models provide an insight into the practical way of applying TQM, as well as a solid foundation for this research, and give the researcher a better understanding of the concept of TQM.

According to Hackman and Wageman (1995), it is safe to assume that Baldrige Award winners actually have implemented the full TQM package. Based on their statement, it can be assumed that the three award winners have fully implemented TQM7.

2.4 Review of Other Research

Worldwide, much research has been conducted in the field of TQM implementation. After a review of the relevant TQM literature, it has been found that different researchers adopted different TQM definitions and frameworks based on their own understanding of TQM and

research objectives. Consequently, there are fewer consensuses on what TQM is and what constitutes it.

TQM can be defined as a set of techniques and procedures used to reduce or eliminate variation from a production process or service-delivery system in order to improve efficiency, reliability, and quality (Steingard and Fitzgibbons, 1993).

It integrates fundamental management techniques, existing improvement efforts, and the technical tools under a disciplined approach focused on continuous improvement (Department of Defense, 1988). According to Kanji and Asher (1996), TQM is a continuous process of improvement for individuals, groups of people, and whole firms; it encompasses a set of four principles (delight the customer, management by fact, people-based management, and continuous improvement) and eight core concepts (customer satisfaction, internal customers are real, all work is process, measurement, teamwork, people make quality, continuous improvement cycle, and prevention).

TQM can also be defined as the application of quality principles for the integration of all functions and processes within the firm (Ross, 1993). There is another definition of TQM, which is a management approach for an organization, centered on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction and benefits to all members of the organization and to society (ISO 8402, 1994).

Flynn et al. (1994) defined TQM as: An integrated approach to achieving and sustaining high quality output, focusing on the maintenance and continuous improvement of processes and defect prevention at all levels and in all functions of the firm, in order to meet or exceed customer expectations. According to Ho and Fung (1994), TQM is a way of managing to improve the effectiveness, flexibility, and competitiveness of a business as a whole. It is also a method of removing waste, by involving everyone in improving the way things are done. According to Vuppapapati et al. (1995), TQM is an integrative philosophy of management for continuously improving the quality of products and processes to achieve customer satisfaction.

Hackman and Wageman (1995) systematically reviewed the three quality gurus' (Deming, Juran, and Ishikawa) propositions about TQM. According to their review results, the following five interventions are the core of TQM: Explicit identification and measurement of customer wants and needs; creation of supplier partnership; use of functional teams to identify and solve quality problems; use of scientific methods to monitor performance and identify points of high leverage for performance improvement; use of process management heuristics to enhance team effectiveness.

Dean and Bowen (1994) defined TQM as a philosophy or approach to management that can be characterized by its principles, practices, and techniques. Its three principles are customer focus, continuous improvement, and teamwork. Each principle is implemented through a set of practices, which are simply activities such as collecting customer information or analyzing processes. The practices are, in turn, supported by a wide array of techniques.

Choi and Eboch (1998) studied the TQM paradox using management of process quality, human resources management, strategic quality planning, and information and analysis as the constructs of TQM implementation. Black and Porter (1996) identified ten critical factors of TQM: People and customer management, supplier partnership, communication of improvement information, customer satisfaction orientation, external interface management, strategic quality management, teamwork structure for improvement, operational quality planning, quality improvement measurement systems, and corporate quality culture. In Powell's 1995 study, the following elements were identified as TQM framework: Executive commitment, adopting the philosophy, closer to customers, closer to suppliers, benchmarking, training, open organization, employee empowerment, zero-defects mentality, flexible manufacturing, process improvement, and measurement.

Ho and Fung (1994) identified ten TQM elements: Leadership, commitment, total customer satisfaction, continuous improvement, total involvement, training and education, ownership, reward and recognition, error prevention, and cooperation and teamwork. Waldman (1994) identified eight key TQM elements as: Top management commitment to place quality as a top priority, a broad definition of quality as meeting customers' expectations, TQM values and vision, the development of a quality culture, involvement and empowerment of all organizational members in cooperative efforts to achieve quality improvements, an

orientation toward managing-by-fact, the commitment to continuously improve employees' capabilities and work processes through training and benchmarking, attempts to get external suppliers and customers involved in TQM efforts. Mann and Kehoe (1994) divided TQM into ten elements. They are supplier improvement, process control and improvement, internal customer focus, measurement and reporting, leadership, quality system, participation, recognition, education and training, and external customer focus.

Although much research has been conducted in the field of TQM implementation, no universally accepted TQM definition or elements presently exist. Actually, researchers have different ideas about TQM concept and elements. However, most agree that TQM is a philosophy or approach to management focusing on continuous improvement, customer focus, systematic process management, supplier partnership, and teamwork. The implementation of such a management philosophy requires a set of practices.

2.5 TQM Concept in this Study

2.5.1 Definition of TQM

Before the concept of TQM is defined, it is necessary to define the concept of quality management. According to ISO 8402 (1994), quality management can be defined as follows:

All activities of the overall management function that determine the quality policy, objectives and responsibilities, and implement them by means such as quality planning, quality control, quality assurance and quality improvement within the quality system

The extensive TQM literature review suggests that TQM encompasses a vast spectrum of topics and perspectives. In the field of TQM implementation, there are three commonly referenced articles written by Saraph et al. (1989), Flynn et al. (1994), and Ahire et al. (1996), respectively. Ahire et al. (1996) strongly recommended that a combination of the three frameworks be undertaken for future research on TQM. In fact, the present study followed this suggestion, attempting to integrate their TQM constructs as much as possible.

Table 2.2 lists the 11 TQM elements in this study and the TQM elements in their frameworks. The two elements "Product quality" and "Supplier performance" in the Ahire et

al. framework were not included in this framework since they represented TQM outcomes. “Role of quality department” in the Saraph et al. framework was excluded in this framework since every department in any organization was involved in quality management.

“Benchmarking” and “Internal quality information usage” in the Ahire et al. framework was similar with the element of “Evaluation” in this study. “Process control” and “Cleanliness and organization” in the Flynn et al. framework were relatively the same as the element of “Process control and improvement” adopted in this study. This study included two more elements, “Quality system improvement” and “Vision and plan statement”, which were not found in their frameworks. Therefore, this TQM concept covers a broader scope of TQM in comparison with their frameworks. In this study, TQM is defined as follows:

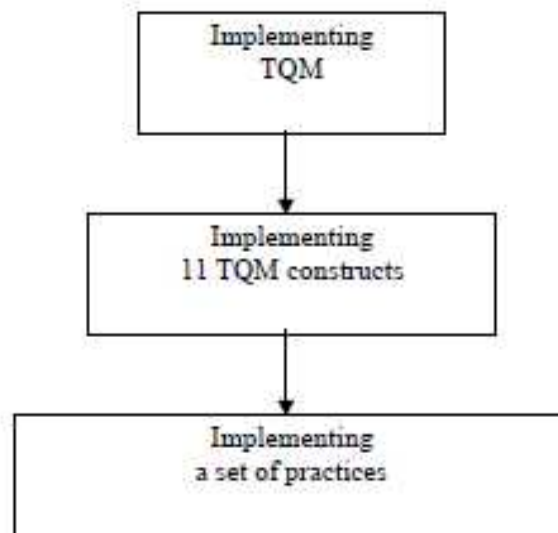
A management philosophy for continuously improving overall business performance based on leadership, supplier quality management, vision and plan statement, evaluation, process control and improvement, product design, quality system improvement, employee participation, recognition and reward, education and training, and customer focus.

Table 2.2
Conceptual Framework Comparison

This framework	1: Leadership; 2: Supplier quality management; 3: Vision and plan statement; 4: Evaluation; 5: Process control and improvement; 6: Product design; 7: Quality system improvement; 8: Employee participation; 9: Recognition and reward; 10: Education and training; 11: Customer focus.
Saraph et al. framework	1: Role of divisional top management and quality policy; 2: Role of quality department; 3: Training; 4: Product/service design; 5: Supplier quality management; 6: Process management/Operating; 7: Quality data and reporting; 8: Employee relations.
Flynn et al. framework	1: Quality leadership; 2: Quality improvement rewards; 3: Process control; 4: Feedback; 5: Cleanliness and organization; 6: New product quality; 7: Inter functional design process; 8: Selection for teamwork potential; 9: Teamwork; 10: Supplier relationship; 11: Customer involvement.
Ahire et al. fram	1: Top management commitment; 2: Customer focus; 3: Supplier quality management; 4: Design quality management; 5: Benchmarking; 6: SPC usage; 7: Internal quality information usage; 8: Employee empowerment; 9: Employee involvement; 10: Employee training; 11: Product quality; 12: Supplier performance.

Thus, TQM consists of 11 constructs. To implement TQM is merely to implement these constructs, which occurs through a set of practices such as using certain quality tools or techniques. Figure 2.1 displays the decomposition of TQM implementation. There are practices that can support the implementation of each of the 11 constructs. The conceptual definitions of the constructs and the practices that support their implementation are presented in the following subsection.

Figure 2.1
A Decomposition Model of TQM Implementation



2.5.2 TQM Constructs

Leadership

Leadership is the ability to inspire confidence and support among those needed to achieve organizational goals (Dubrin, 1995). Anderson et al. (1994a) explained the concept of leadership as: The ability of top management to establish, practice, and lead a long-term vision for the firm, driven by changing customer requirements, as opposed to an internal management control role. Leadership is thus exemplified by clarity of vision, long-term orientation, coaching management style, participative change, employee empowerment, and planning and implementing organizational change.

According to Juran and Gryna (1993), certain roles of top management can be identified as: Establish quality policies, establish and deploy quality goals, provide resources, provide

problem-oriented training, and stimulate improvement. The European Quality Award (1994) and the Malcolm Baldrige Quality

Award (1999) recognize the crucial role of leadership in creating the goals, values and systems that guide the pursuit of continuous performance improvement. Recognition of the critical role of leadership and its responsibility in pursuit of continuous quality improvement echoes the arguments put forward by quality gurus such as Deming (1986),

Juran (Juran and Gryna, 1993), and Crosby (1979). Thus, the concept of leadership in this study can be defined as the ability of top management to lead the firm in continuously pursuing long-term overall business success. This is exemplified by top management participation, top management encouragement, employee empowerment, top management learning, top management commitment to employee education and training, and top management pursuit of product quality and long-term business success.

A predominant theme in quality management literature is that strong commitment from top management is vital. The foundation of an effective leadership effort is top commitment. Demonstrating such commitment is therefore a primary leadership principle for achieving TQM. Lack of top management commitment is one of the reasons for the failure of TQM efforts (Brown et al., 1994). However, top management commitment itself is not sufficient.

It is more important that top management personally participate in various quality management activities. Furthermore, it should strongly encourage employee involvement in quality management activities. According to Durbin (1995), an important leadership practice is to encourage people to assess the level of quality.

To be an effective leader in most modern firms, the top manager must continue to develop and learn. Knowledge of the business and continual learning are essential prerequisites to effective leadership (Dubrin, 1995). The extensive literature review by Anderson et al. (1994a) suggested that if leadership wants to create organizational cultures that will themselves be more amenable to learning, they must set the example by becoming learners themselves and involving others in the learning process. Thus, a learning organization will be established.

Empowerment is the process of delegating decision-making responsibility to lower levels within the firm. Particularly dramatic is empowerment of the workforce (Juran and Gryna, 1993), which is valuable because it may release creative energy (Dubrin, 1995). In order to effectively lead the firm, top management must empower employees to solve the problems they encounter. Thus, employees can have the responsibility to fix problems and prevent their further occurrence.

In order to effectively lead the firm, top management must be committed to providing sufficient resources for employees' education and training, building trustful relationships with employees, and regarding them as valuable resources of the firm. Top management must be committed to allocating sufficient resources to prevent, as well as repair, quality problems. Top management should discuss quality frequently; for example, by giving speeches on the topic and asking questions about quality at every staff meeting. In fact, people make things happen. Therefore, top management must train and coach employees to access, analyze, and improve work processes (Dale and Plunkett, 1990; Deming, 1986).

The study conducted by Garvin (1986) suggested that high levels of quality performance were always accompanied by an organizational commitment to that goal; high product quality did not exist without strong top management commitment. Many such empirical studies have also found that top management support for quality was a key factor in quality improvement. Therefore, it is essential that top management focus on product quality rather than yields alone. More importantly, it is critical for the firm to pursue long-term business success. Pursuing short-term business success places quality behind yield, costs, and meeting delivery schedules, according to this study's researcher.

Supplier Quality Management

Supplier quality management can be defined as the set of supplier-related quality management practices for improving suppliers' quality of products and services. This is exemplified by firm-supplier partnership, product quality as the criterion for supplier selection, participation in suppliers, communication with suppliers, understanding of supplier performance, and supplier quality audit (Mann, 1992; Zhang, 2000a). Dramatically. The supplier becomes an extension of the buyer's organization to a certain extent. A

revolution in the relationship between buyers and suppliers has emerged in the form of supplier partnership (Juran and Gryna, 1993).

According to the review by Hackman and Wageman (1995), developing partnerships with suppliers is one of the major TQM implementation practices. The extensive literature review by Anderson et al. (1994a) indicated that external cooperation between a firm and its suppliers has merits in the just-in time purchasing systems. Working collaboratively with suppliers on a long-term basis is truly beneficial. Deming (1986) strongly recommended working with the supplier as a partner in a long-term relationship of loyalty and trust to improve the quality of incoming materials and decrease costs. A long-term relationship between purchaser and supplier is necessary for the best economy.

Deming (1986) and Ishikawa (1985) suggested that firms select their suppliers on the basis of quality, rather than solely on price. According to Deming (1986), price has no meaning without a measure of the quality being purchased. Without adequate measures of quality, business drifts to the lowest bidder, low quality and high cost being the inevitable result. The firm must change its focus from lowest initial cost of material purchased to lowest total cost. Firms should try to minimize average total cost for inspection of incoming materials.

According to Juran and Gryna (1993), it is an effective practice to optimize quality costs when a purchasing decision is made. To the purchasing price, the buyer must add a whole array of quality-related costs: Incoming inspection, materials review, production delays, downtime, extra inventories, internal failure costs, and external failure costs. The lowest purchasing price does not always result in the lowest total costs.

Deming (1986) and Ishikawa (1985) recommended that firms work directly with suppliers to ensure that their materials are of the highest possible quality. Firms should participate directly in supplier activities related to quality, such as supplier improvement projects and supplier training (Mann, 1992; Zhang, 2000a).

Evaluating suppliers is an important activity to assure the dependable high quality of incoming materials in the firm (Feigenbaum, 1991). Supplier rating is a technique to provide supplier assessment. Each supplier is measured against another specific supplier or group of

suppliers, for price, quality, delivery, and other important performance measures. Supplier performance rating involves objective appraisal of one supplier's performance, which can feed back to that supplier. In the case of a poor quality situation, such information can be used by the supplier to formulate corrective action. Supplier quality rating also provides a quantitative summary of supplier quality over a period of time (Juran and Gryna, 1993). Incoming material control is very important for supplier quality management. Specifications and standards should be established as criteria for acceptance of raw materials, parts, and components. Techniques such as acceptance sampling inspection and 100% inspection can be used to provide acceptance at most economical levels (Feigenbaum, 1991).

Firms need to have detailed information about supplier quality information such as drawings, specifications, and other necessary data. It is also very important to establish a supplier information feedback system, which can be used for giving feedback to suppliers about their product performance. Such information may be used to further improving supplier performance. A purchasing system includes three key activities: Specification of requirements, selection of a supplier, and contract management. The overall quality objective is to meet the needs of the firm with a minimum of incoming inspection or later corrective action (Feigenbaum, 1991; Juran and Gryna, 1993).

Supplier quality audit is an organized evaluation of supplier capabilities to furnish materials of the necessary quality and quantity is an important basis for initial supplier selection and ongoing supplier quality surveillance (Feigenbaum, 1991). Surveillance can take several forms: Inspection of product, meetings with suppliers to review quality status, audits of elements of the supplier, review of SPC data, and witnessing of specific operations or tests (Juran and Gryna, 1993). What one firm buys from another is not just material: It buys something more important, namely, engineering and capability (Deming, 1986). These requirements of a supplier must be established long before it produces any material.

Vision and Plan Statement

Vision and plan statement has two aspects: Vision statement and plan statement, which are explained as follows:

A vision statement describes how a firm wants to be seen in its chosen business. As such, it describes standards, values, and beliefs. Above all, a vision is the advertisement of the intention to change. As such, it propels the firm forward and acts against complacency. All employees should be able to realize how they can contribute to the vision. A statement of values and behavior is a powerful motivating force that can be used to drive a process of change forward (Kanji and Asher, 1993). The intent of a vision statement is to communicate the firm's values, aspirations and purpose, so that employees can make decisions that are consistent with and supportive of these objectives (Meredith and Shafer, 1999). An effective vision statement tends to be written using language that can inspire employees to high levels of performance, and further, to foster their commitment. Therefore, a firm should have a long-term vision statement. A quality policy is overall intentions and direction of an organization with regard to quality, as formally expressed by top management (ISO 8402, 1994).

Similarly, a quality policy describes how a firm wants to be seen regarding its quality. In this regard, a quality policy is a quality "vision statement". A variety of employees should be involved in the development of the vision statement and quality policy, which in return, should be well communicated to employees at different levels to stimulate commitment. In fact, a vision statement usually cascades down to mission statements that detail short-term firm goals or departmental aims. In order to realize a vision statement, a firm must make plan statements that support the realization of its vision (Mann, 1992).

A plan statement is a formalization of what is intended to happen at some time in the future. A plan cannot guarantee that an event will actually happen; it is a statement of intention that "will happen" (Slack et al., 1995). In a firm, there are many kinds of plans, including a strategic business performance plan, quality goal plan, and quality improvement plan. A strategic business performance plan can be divided into long- and short-term business performance plans that include, for example, market share, profits, annual sales, exports, and sales growth. A quality goal plan can involve, for example, conformity rate, defect rate, internal failure costs, external failure costs, performance, reliability, and durability. A quality improvement plan aims for quality improvement, which is actions taken throughout the organization to increase the effectiveness and efficiency of activities and processes in

order to provide added benefits to both the organization and its customers (ISO 8402, 1994). Employees at different levels should be involved in drawing up these plans, which should be well communicated to employees, in turn encouraging their commitment to the realization of these plans (Mann, 1992).

Evaluation

The concept of evaluation can be defined as systematic examination of the extent to which an entity is capable of fulfilling specified requirements (ISO 8402, 1994). Juran and Gryna (1993) stated that a formal evaluation of quality offers a starting point by providing an understanding of the size of the quality issue and the areas demanding attention. Evaluation can identify the difference between actual performance and the goal. Evaluating the situation in a firm's quality management practices provides an important base for the firm to improve its quality management practices. Such evaluation information should be communicated to employees in order to encourage employees to make things better. Hackman and Wageman (1995) proposed that evaluation of variability is a change principle. Uncontrolled variance in processes or outcomes is the primary cause of quality problems and must be evaluated and controlled by those who perform the firm's front-line work. Only when the root causes of variability have been identified are employees in a position to take appropriate steps to improve work processes. There is a set of practices that can support the implementation of evaluation.

A firm operates in a dynamic and turbulent environment. In order to maintain competitive advantages in the marketplace, the firm should continuously evaluate its various business strategies. Business strategy is a set of objectives, plans, and policies for the firm to compete successfully in its markets (Meredith and Shafer, 1999). In effect, the business strategy specifies what the firm's competitive advantage will be and how this advantage will be achieved and sustained. Based on such evaluation activities, the firm can adjust its business strategy in order to keep it dynamic (Mann, 1992).

Quality audit is systematic and independent examination to determine whether quality activities and related results comply with planned arrangements, and whether these arrangements are implemented effectively and are suitable to achieve objectives. Quality

audit can be used for quality system, processes, products, and services. One purpose of a quality audit is to evaluate the need for improvement or corrective action (ISO 8402, 1994).

Benchmarking is a powerful tool to use as a continuous process of evaluating a firm's products, services, and processes against those of its toughest competitors or of firms renowned as world-class or industry leaders. A benchmarking is a point of reference by which performance is judged or measured; Competitive benchmarking is the continuous process of measuring products, services, and practices against those of the toughest competitors or leading firms (DuBrin, 1995). According to Slack et al. (1995), there are many types of benchmarking such as internal, external, non-competitive, competitive, performance, and practice. Benchmarking is able to judge how well an operation is performing, and can be seen as one approach to setting realistic performance standards. It is also concerned with searching out new ideas and practices that might be able to be copied or adapted. Benchmarking is an effective tool for guiding the establishment of quality improvement goals, evaluating various activities within the firm, and assessing customer requirements (Hackman and Wageman, 1995).

Quality costs can be divided into four categories: Internal failure, external failure, appraisal, and prevention (Juran and Gryna, 1993). According to Feigenbaum (1991), the periodic collection and analysis of quality-related costs monitors the cost effectiveness of the quality system. The objective is to track quality-cost trends in both total, as well as individual, quality-cost fields. Timely measurement and reporting of quality level data are used in assessing quality performance, setting quality-level goals, and evaluating corrective-action efforts. Such information is becoming the basis for establishing improvement goals, priority schedules and so on. The objective of evaluation of quality-related costs is to formulate opportunities for reducing cost and reducing customer dissatisfaction. The analysis of quality-related costs helps to identify those opportunities for improvement that offer the largest cost savings (Ishikawa, 1985).

In order to encourage employees to pay attention to quality, quality-related data should be used for evaluating employee performance. Quality-related indices should be combined with general employee performance standards. Quality-related data should also be used to evaluate the performance of employees at different levels and the performance of the whole

firm, and should be displayed at the shop floor in order to make employees understand what happens concerning quality. Please note that the major aim of evaluation is improvement, not criticism. In order to have an effective evaluation, a quality information system is truly necessary, as it is an organized method of collecting, storing, analyzing, and reporting information on quality to assist decision-makers at all levels (Juran and Gryna, 1993; Mann, 1992).

Process Control and Improvement

Process refers to certain unique combinations of machines, tools, methods, materials, and people engaged in production. Process control and improvement⁹ connotes a set of methodological and behavioral practices, which are implemented to control and improve processes that produce products and services (Juran and Gryna, 1993). In fact, process control and improvement can make the manufacturing process operate as expected, without breakdowns, missing materials, fixtures, tools, etc., and despite workforce variability (Flynn et al., 1994). A set of practices of process control and improvement is described in the following paragraphs.

The Japanese strongly believe that an atmosphere of cleanliness adds to quality, thus, shop floor management is highly emphasized by Japanese firms (Deming, 1986). It is a very important practice to keep the firm neat and clean at all times, which can contribute to effective process control and improvement (Ho, 1999).

An important matter in process control and improvement is the maintenance of process capability to meet production requirements. Process capability is largely independent of specification tolerances for parts to be manufactured within the process. It is important to determine these capabilities as fundamental to product-control standards setting (Feigenbaum, 1991). Process capability study provides a basis for this determination and its related assignment of parts to those facilities that can economically maintain the required tolerances (Gitlow et al., 1989).

One aspect of process control and improvement is equipment maintenance, which ensures that variation is kept within acceptable bounds, keeping the manufacturing process running smoothly. Process capability is the measured, inherent variation of the product turned out by

a process, and provides a quantified prediction of process adequacy (Juran and Gryna, 1993).

According to Feigenbaum (1991), manufacturing equipment inevitably wears under constant use, a result of which would be poor-quality products. A program of preventive maintenance is an important quality management practice since it enables a regularly scheduled examination of processing facilities before they break down. According to Deming (1986), Japanese machine operators regularly make minor repairs, perform maintenance work, and record machine performance data.

Deming (1986) stated that improving product quality should not be dependent on mass inspection. Inspection to improve quality is too late, ineffective, and costly. Quality comes not from inspection, but from improvement of the production process. In this regard, a firm should try to implement effective inspection activities in order to reduce any non-value added activities.

A firm should try to design its process to be “foolproof” in order to minimize the chance of employee error. Fool proofing describes methods, such as poka-yoke, which ensure that activities or operations can only be performed the correct way. Fool proofing methods can be divided into two types: Alarms and controls. Alarm devices may light a red lamp, sound a buzzer, or flash an alarm light if a mistake is detected. Control devices may interrupt work by activating a clamp, stopping a machine, or halting a conveyor if a mistake occurs so that a defect does not move on to the next process (Slack et al., 1995).

Statistical process control is the application of statistical methods to the measurement and analysis of variation in any process (Juran and Gryna, 1993). Statistical process control can be used to achieve process stability, provide guidance on how the process may be improved by the reduction of variation, assess the performance of a process, and provide information to assist with management decision-making (Dale, 1999). Without statistical control, the process is in chaos, the noise of which will mask the effect of any attempt to bring improvement (Deming, 1986).

A number of quality tools or techniques can be implemented to control and improve processes. These methods include the seven QC tools and the seven new QC tools. The PDCA cycle is essentially the scientific method applied to continuous process improvement (Dale, 1999; Deming, 1986; Mann, 1992).

Product Design

Product design translates customer expectations for functional requirements into specific engineering and quality characteristics, which can be called specifications. Sound product design can contribute to the improvement of product quality to be better than that of competitors, increasing a firm's competitive advantage in the marketplace (Juran and Gryna, 1993). There is a set of practices that can be used to design products.

In order to have effective product design, design engineers are required to have some shop floor experience such as processing technology, understanding of performance of production equipment, skill for operating production equipment, and production process. Such knowledge can contribute to robust product design. Thus, fewer problems will occur during the process of production (Feigenbaum, 1991; Juran and Gryna, 1993; Slack et al., 1995).

In fact, product design starts with market research. Therefore, it is an important practice for design engineers to have some marketing experience and knowledge, making it easier for them to understand customer needs, expectations, and future requirements. As a result, product design will be more market-oriented (Feigenbaum, 1991; Juran and Gryna, 1993).

Customer requirements and expectations should be thoroughly considered during the process of product design. It is important that design department obtain detailed information from the field. Field failure data and customer complaints should be sufficiently detailed to provide a means for analyzing the causes, so that proper corrective action can be taken toward improving product design (Feigenbaum, 1991; Juran and Gryna, 1993).

Different departments in a firm should participate in new product design. Such design teams composed of people from such departments as design, engineering, production, and sales can contribute to improvement of product design and design for the future (Deming, 1986). The participation of different departments in product design can ensure fewer problems

during the process of production as well as after products are delivered to customers (Juran and Gryna, 1991).

Before production, new product design should be thoroughly reviewed in order to avoid problems during production. Design review is documented, comprehensive and systematic examination of a design to evaluate its capability to fulfill the requirements for quality, identify problems, if any, and propose the development of solutions (ISO 8402, 1994).

Price is still an important factor affecting competitive capability of products in the marketplace (Meredith and Shafer, 1999). Therefore, cost should be paid sufficient attention during the process of product design. It is possible that reducing production cost does not sacrifice product performance. Value engineering is a technique for evaluating the design of a product to assure that the essential functions are provided at minimal overall cost (Juran and Gryna, 1993).

For traditional products, product design process is not complex and can be achieved by experienced design engineers without using any special techniques. For modern products, certain special techniques or methods should be used to achieve successful product design (Juran and Gryna, 1993). According to the researcher's previous research (Zhang, 1998b, 1998d), experimental design is a widely used tool in product design. Its application has significantly reduced the time and expense needed to develop the new product, greatly improved the performance of the new product, and led to the success of new product design.

Quality function deployment is also an important and effective method in product design (Daetz et al., 1995). It is primarily concerned with the relationship between customer needs and new product attributes, which can support the establishment of a market advantage (Daetz et al., 1995; Reed et al. 1996; Slack et al., 1995). This technique consists of a series of interlocking matrixes that translates customer needs into product and process characteristics (Juran and Gryna, 1993).

Quality System Improvement

Quality system is defined as the organizational structure, procedures, processes and resources needed to implement quality management (ISO 8402, 1994). In 1987, the

International Standardization Organization published the ISO 9000 standards series on quality management and quality assurance. Implementing ISO 9000 is a way in pursuing quality system improvement in a firm. In this study, quality system improvement means to establish a quality system according to the requirements of ISO 9000. Through the implementation of ISO 9000, a quality manual, quality system procedures, and work instructions are established. In the end, a firm may apply to be registered as having an ISO 9001 (9002 or 9003) quality certificate (Randall, 1995; Mirams and McElheron, 1995).

A quality manual is a document stating the quality policy and describing the quality system of an organization (ISO 8402, 1994), and should cover all the applicable elements of the quality system standard required for an organization. Guidelines for developing quality manuals (ISO 10013, 1995) can be used for drawing up a quality manual.

A procedure is a specified way to perform an activity. A written procedure contains the purposes and scope of an activity; what shall be done and by whom; when, where and how it should be done; what materials, equipment and documents shall be used; and how it shall be controlled and recorded. Documented quality system documents describe the activities of individual functional units needed to implement the quality system elements (ISO 8402, 1994; ISO 10013, 1995)

Work instructions consist of detailed work documents, which can guide people in conducting specific work. It should be noted that drawing up various work instructions should be based on the existing documents and characteristics of the firm, and should be presented to different people for extensive review. Thus, these work instructions can be effectively implemented in practice (Randall, 1995; Mirams and McElheron, 1995).

With an ISO 9000 quality system in place, a firm may consider becoming ISO 9000 certified. Please note that a quality system should be continuously improved. Quality system documents should be continuously modified with the change of quality activities within the firm. Of course, it is essential to maintain the quality system's conformance with the ISO 9000 requirements (Randall, 1995).

Employee Participation

Employee participation can be defined as the degree to which employees in a firm engage in various quality management activities. By personally participating in quality management activities, employees acquire new knowledge, see the benefits of the quality disciplines, and obtain a sense of accomplishment by solving quality problems. Participation is decisive in inspiring action on quality management (Juran and Gryna, 1993). Employee participation is exemplified by things such as teamwork, employee suggestions, and employee commitment. A remarkable characteristic of employee participation is teamwork (e.g., cross-functional teams and within-functional teams). The aim of a team is to improve the input and output of any stage. A team may well be composed of people from different staff areas, everyone having a chance to contribute ideas, plans, and figures. Teamwork is sorely needed throughout the firm; it can compensate one's strength for another's weakness (Deming, 1986). Group work and group decision-making offer several advantages over individual effort. If several knowledgeable people are brought into the decision-making process, a number of worthwhile possibilities may be uncovered, making synergy a possible benefit. Group members often evaluate each other's thinking, thus the team is likely to avoid major errors (Durbin, 1995). Cross-functional quality teams and task forces are among the most common features of TQM firms (Hackman and Wageman, 1995). Teamwork can be characterized as collaboration between managers and non-managers, between different functions (Dean and Bowen, 1994). Teamwork practices include identifying the needs of all groups and firms involved in decision-making, trying to find solutions that will benefit everyone involved, and sharing responsibility and credit. Such practices are often implemented by forming teams. Hackman and Wageman (1995) stated that the single most commonly used TQM implementation practice is formation of short-term problem-solving teams. Problem-solving teams work on a wide variety of tasks, ranging from cross functional involvement in tackling quality problems related to many functional departments to solving within-functional quality problems. Anderson et al. (1994a) suggested that internal cooperation among employees enables higher individual performance by creating mutually beneficial situations among organizational members and between organizational members, and the firm as a whole.

A quality control (QC) circle is a group of workforce-level people, usually from within one department, who volunteer to meet weekly to address quality problems that occur within their department (Juran and Gryna, 1993). QC circles have been successfully implemented in Japan, contributing a great deal to the Japanese economy (Lillrank and Kano, 1989).

Hackman and Wageman (1995) stated that 65% TQM firms create employee suggestion systems. Production workers should regularly participate in operating decisions such as planning, goal setting, and monitoring of performance. They are encouraged to make suggestions and take a relatively high degree of responsibility for overall performance (Deming, 1986). To have effective employee participation, employee contributions and ideas must receive serious consideration and be placed into operation whenever the recommendations are sound and relevant. Among the motivational programs that have received major attention are employee suggestion programs (Feigenbaum, 1991). Deming (1986) and Ishikawa (1985) identified one source of human motivation at work as task motivation, the good feeling that comes from accomplishing things and seeing them actually work.

For achieving effective employee participation, employees should be committed to their jobs. Job commitment can be defined in terms of one's loyalty, identification, and involvement with the firm (Mitchell, 1979). If employees are committed to their jobs, they will be motivated to spend more energy on providing high process, product, and service quality to satisfy the firm's customers (Lam, 1995)

In order to have effective employee participation, employees should be encouraged to report their own working problems as well as problems they find in other areas of the firm. Employees should be encouraged to inform top managers or supervisors concerning conditions that need correction (e.g., inherited defects, machines not maintained, and poor tools). More importantly, employees should be encouraged to fix their own working problems (Deming, 1986).

Recognition and Reward

Recognition is defined as the public acknowledgment of superior performance of specific activities. Reward is defined as benefits, such as increased salary, bonuses and promotion,

which are conferred for generally superior performance with respect to goals (Juran and Gryna, 1993). Public recognition is an important source of human motivation (Deming, 1986). It almost goes without saying that an important feature of any quality improvement program is the showing of due recognition for improved performance by any individual, section, department or division within the firm (Dale and Plunkett, 1990). To effectively support their quality effort, firms must implement an employee compensation system that strongly links quality and customer satisfaction with pay (Brown et al., 1994). Deming (1986) and Ishikawa (1985) identified one source of human motivation at work as social motivation, the energy that comes from cooperation with others on a shared task and the incentive provided by recognition from others. A large majority of firms implementing TQM modify their performance measurement and reward systems so that achievement of specific quality goals can be assessed and rewarded (Hackman and Wageman, 1995). TQM implementation relies increasingly on performance measurement and performance. Contingent rewards to motivate and control employees. According to the review results by Hackman and Wageman (1995), 85% of TQM firms have developed programs to reward individuals and teams for quality achievement.

DuBrin (1995) stated that punishment is a behavior modification strategy. Punishment is the presentation of an undesirable consequence or the removal of a desirable consequence because of unacceptable behavior, and is regarded as negative motivator. DuBrin (1995) further proposed that a reward and recognition system should be equitable. Workers who achieve the same level of performance should receive comparable rewards. Similarly, workers who fail to obtain certain levels of performance should receive comparable punishment. In this regard, punishment is a special recognition and “reward” for employees who do not perform well. It is important to note that employees’ recognition and rewards should be based on equity. Effective recognition and reward activities can stimulate employee commitment to the firm.

A firm’s TQM initiative must be supported with a recognition and reward system that encourages and motivates employees to achieve the desired performance. Firms that are serious about achieving quality and customer satisfaction must integrate these aspects into their recognition and reward system. Ishikawa (1985) suggested that firm-wide gain-sharing

or profit-sharing programs can appropriately be used to recognize and reward collective excellence. Excellent employee suggestions should be financially rewarded in order to encourage employee participation. The forms of recognition can be a praise letter, an oral praise, award ceremony, moral award, publicly presenting successful working experiences (Zhang, 2000a). Mann and Kehoe (1994) suggested that working condition improvement be used to recognize employee quality improvement efforts. Cherrington (1995) stated that the forms of reward can be merit pay, piece-rate incentives, team and group incentives, skill based pay and pay-for-knowledge, suggestion system, profit sharing, salary increase, and bonus scheme.

Education and Training

Training refers to the acquisition of specific skills or knowledge. Training programs attempt to teach employees how to perform particular activities or a specific job. Education, on the other hand, is much more general, and attempts to provide employees with general knowledge that can be applied in many different settings (Cherrington, 1995). Cherrington suggested that education and training require a systematic approach. The development of a sound education and training program requires systematically gathering data about the employees' or the firm's needs. A good assessment includes an analysis of: How well the firm is achieving its goals; the skills needed by the workforce to accomplish these goals; and the strengths and weaknesses of the current workforce. A careful analysis of these items provides valuable information to design effective training activities. Investment in education and training is vitally important for ensuring the success of education and training programs.

According to Hackman and Wageman (1995), training is the second most commonly used TQM implementation practice in the United States. Firms that implement TQM invest heavily in training for employees at different levels. Deming (1986) spoke often of the importance of properly training workers in performing their work. Otherwise, it is difficult to improve their work.

The cross-functional quality teams among the characteristics of TQM firms stack the cards in favor of learning by the simple fact that they are cross-functional; individual members are exposed to more, and more diverse, points of view than would be the case if they worked mostly by themselves or in within-functional teams (Hackman and Wageman, 1995).

Learning is the ability and willingness of the firm to engage in learning or knowledge seeking activities at the individual, group or team, and organizational levels (Anderson et al., 1994a). In order to have effective learning activities, a firm should continually encourage employees to accept education and training.

The TQM aspiration of continuous improvement in meeting customer requirements is supported by a thorough learning orientation, including substantial investments in training and the widespread use of statistical and interpersonal techniques designed to promote individual and team learning (Hackman and Wageman, 1995). According to Deming (1986), Japanese firms obviously regard their employees as their most significant competitive assets and provide good general orientation as well as training in specific skills. Note that investment in employee education and training is to pursue long-term overall business excellence. In fact, employees are valuable resources worthy of receiving education and training throughout their career development.

Ishikawa (1985) advocated that employees accept training for the seven QC tools. According to Feigenbaum (1991), a brief and general course for first-line supervision is modern methods of planning and controlling quality, concentrating essentially upon the physical elements affecting product quality. In order to use various quality tools or methods effectively, employees should be trained in these methods. More training should be given to employees such as quality inspectors, supervisors, and production operators. It is important to provide training to employees just at the time they need it; namely, just-in-time training.

In order to perform their work well, employees at different levels should accept specific work-skills training. Such training can improve employees' skills. In addition, employees should accept quality consciousness education in order to improve their commitment to quality. Newly recruited employees should accept more education on quality awareness. Newsletter, poster slogan, and quality day are commonly used for educating and/or training employees (Zhang, 2000a). Education and training have failed if they do not result in a change of behavior (Juran and Gryna, 1993).

Customer Focus

Customer focus can be defined as the degree to which a firm continuously satisfies customer needs and expectations. A successful firm recognizes the need to put the customer first in every decision made (Philips Quality, 1995). The key to quality management is maintaining a close relationship with the customer in order to fully determine the customer's needs, as well as to receive feedback on the extent to which those needs are being met. The customer should be closely involved in the product design and development process, with input at every stage, so that there is less likelihood of quality problems once full production begins (Flynn et al., 1994). Deming (1986) suggested that the customer is the most important part of the production line; product should be aimed at the needs of the customer.

Obtaining customer complaint information is to seek opportunities to improve product and service quality. Quality complaints have different problems that require different actions. Based on customer complaint information, it is important to identify the "vital few" serious complaints that demand in-depth study in order to discover the basic causes and to remedy those causes (Juran and Gryna, 1993). To improve customer focus efforts, customer complaints should therefore be treated with top priority. Records and analyses of customer complaint reports from the field furnish useful product-control information. Such information reflects the effectiveness of control programs and highlights those nonconformities upon which more aggressive corrective action must be initiated (Feigenbaum, 1991).

Obtaining customer satisfaction information is essential for pursuing customer focus efforts. Intensive examination of finished products from the viewpoint of the customer can be a useful predictor of customer satisfaction. Such information includes data on field failures and service-call rates, and analysis and reporting of customer attitude trends regarding product quality. Such information is valuable for new product development (Feigenbaum, 1991). The results of customer satisfaction surveys can be used to take immediate action on customer complaints, identify problems requiring generic corrective action, and provide a quantitative measurement of customer satisfaction (Juran and Gryna, 1993). Customer satisfaction may very well predict the future success or failure of a firm (Kanji and Asher,

1993). Thus, it is very important to find customer satisfaction and perception of quality. The insights gained can clearly help the firm improve quality.

In-depth marketing research can identify suddenly arising customer needs. The attainment of quality requires the performance of a wide variety of identification activities of quality tasks such as the study of customers' quality needs, design review, and field complaint analysis (Juran and Gryna, 1993). To achieve quality, it is essential to know what customers need and provide products that meet their requirements (Ishikawa, 1985). According to the review results from Hackman and Wageman (1995), obtaining data about customers is one of the most commonly used TQM implementation practices. Deming (1986) suggested that firms understand what the customer needs and wishes now and in the future, so that products and services can be designed to satisfy those needs and wishes.

In order to pursue customer focus, firms should always provide warranties on their products sold to customers. Thus, customers will reduce their risk in buying products. In addition, firms should pay sufficient attention to customer services. In a word, pursuing customer focus efforts should be a long-term business strategy; it is never ending (Juran and Gryna, 1993).

2.6 Summary

This chapter began with reviewing TQM concept from quality gurus Deming, Juran, Crosby, Feigenbaum, and Ishikawa. Then, three quality award models were reviewed. These three awards are: The Deming Prize in Japan, the European Model for Total Quality Management in Europe, and the Malcolm Baldrige National Quality Award in the United States of America. In addition, some TQM literature from other researchers was studied. Based on the results of the literature review, the concept of TQM was defined. In this study, TQM consists of 11 constructs; implementing TQM is merely to implement these 11 constructs. Implementing each construct is through a set of TQM practices. The detailed explanations of these constructs and the set of practices that support their implementation were also described.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents an overview of the methodological perspective of the research. Section 3.2 describes the research design based on the research questions. Section 3.2.1 presents the research strategy of a questionnaire survey. Section 3.2.2 and 3.2.3 presents the research sample and Data analysis respectively.

3.2 Research Design

The role of research design is to connect the questions to data. Design sits between the two, showing how the research questions will be connected to the data, and the tools and procedures to use in answering them. Research design must follow from the questions and fit them with data. The design is the basic plan for a piece of empirical research, and includes main ideas such as strategy, sample, and the tools and procedures to be used for collecting and analyzing empirical data (Punch, 2000). In this section, only the research strategies and general research sample are described. Other aspects such as tools and procedures used for collecting data, detailed sample determination for the questionnaire survey, the structured interviews, and the case study are also presented.

3.2.1 Research Strategies

For conducting empirical research, there are two methods of data collection: Qualitative and quantitative. These two methods have their strengths and weaknesses. The qualitative method permits researchers to study selected issues in depth and detail. Approaching fieldwork without being constrained by predetermined categories of analysis contributes to the depth, openness, and detail of qualitative inquiry.

The quantitative method, on the other hand, requires the use of standardized instruments so that the varying perspectives and experiences of people can fit a limited number of predetermined response categories, to which numbers are assigned. The advantage of a quantitative method is that it is possible to measure the reactions of a great many people to a limited set of questions, thus facilitating comparison and statistical aggregation of the data.

This gives a broad, generalizable set of findings presented succinctly and parsimoniously. By contrast, a qualitative method typically produces a wealth of detailed information about a much smaller number of people and cases. This increases understanding of the cases and situations studied but reduce generalization (Patton, 1990).

In order to avoid their respective disadvantages, one important way to strengthen a research design is to use both qualitative and quantitative methods. A number of research strategies are available for conducting social sciences: Experiments, surveys, histories, case studies, and the analysis of archival information.

Based on the five research questions proposed in this study, the research strategies of a literature review, a questionnaire survey, structured interviews, and a case study were adopted in this research.

3.2.2 Research Sample

Manufacturing firm in Biratnager namely, Hulas Motor were selected for investigation due to the position as one of the most important industrial centers in Nepal, as well as for reasons of practicality and convenience perceived by the researcher.

3.2.3 Data Analysis

For achieving the objectives in this study based on case study, the questionnaires were developed according to the conceptual framework on Total Quality Management. The obtained information was then classified according the strength and Weakness of the firm as Strong, Average and Weak based on TQM Gurus concepts. The obtained data from questionnaire were tabulated as appropriate. The tabulated information has been explained and analysed according to the responses gained from the concerned researchchery.

CHAPTER IV

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

In this study, a research questionnaire was developed and used to obtain empirical data from Nepalese manufacturing firms in order to test the theoretical models hypothesized in this study. In the questionnaire, there were two measurement instruments used to measure TQM implementation and overall business performance, respectively. Each instrument had some measurement scales (see Appendices 1 and 2).

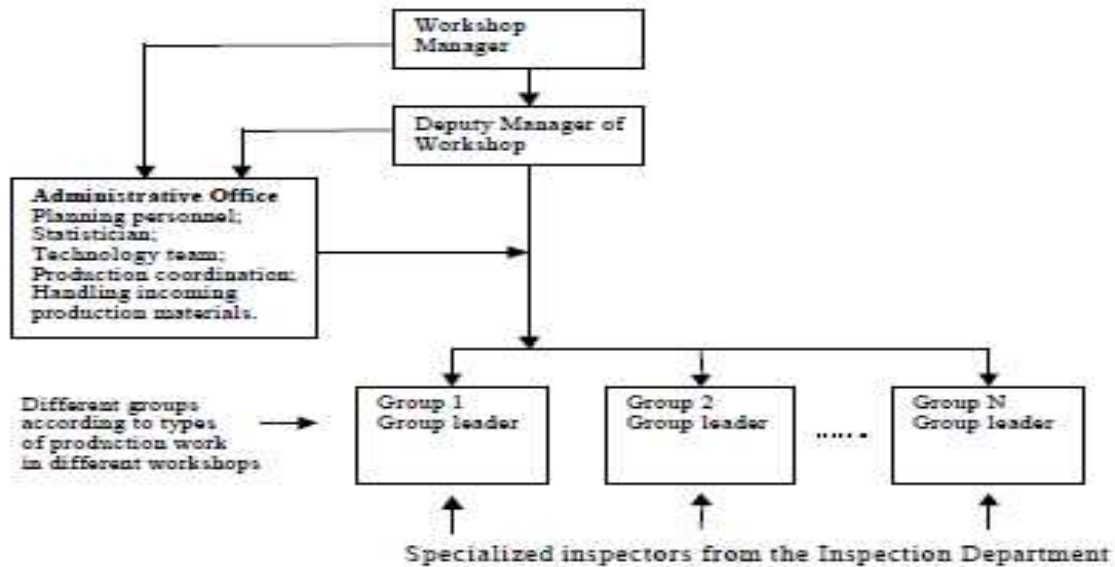
4.2 A Brief Introduction of the Firm



Hulas Motors Pvt. Ltd. is the leading and the only commercial vehicle manufacturer in Nepal. manufacturing Light commercial vehicle (LCV) as well as Mini Utility Vehicle (MUV). Hulas Motors Pvt. Ltd. was established in the year 1996 (B. S. 2054). It is a sister concern of Golchha Organization one of the biggest organization in Nepal. The design of Sherpa, Mustang and Mini V is indigenious. The complete R&D is done in house. In addition to having team of experienced and qualified technical staff and infrastructure, it has strategic alliance with sister concern, Hulas Steel Industries who provides us a engineering & mechanical support. Hulas steel industries have a team of dedicated and experienced full time mechanical engineers in addition they also provide us with technical information for the use of laboratories and engineering software such as RISA 3 D & Auto CAD. At present more than 700 Sherpa and Mustang vehicles are running on Nepalese road.

Figure 4.1 displays the structure of workshops.

Figure No. 4.1
Workshop Structure



4.3 Evaluation of TQM Implementation and Overall Business Performance

The TQM implementation model was used in evaluating the firm's TQM implementation practices and overall business performance. The researcher conducted the evaluation guided by the assessment tools (see Appendix 2). Appendix 2 presents the evaluation results, which were translated into scores according to the scoring methods, as well as the strengths and weaknesses of TQM implementation practices and overall business performance. These weak areas can be used as possibilities for the firm to improve its TQM implementation and overall business performance, however, it should be noted that even its strong areas are not at all perfect. They still have room for improvement. Strong and average areas are just a relative sense compared with the firm's weak areas, though weak areas should receive more attention.

4.3.1 TQM Implementation

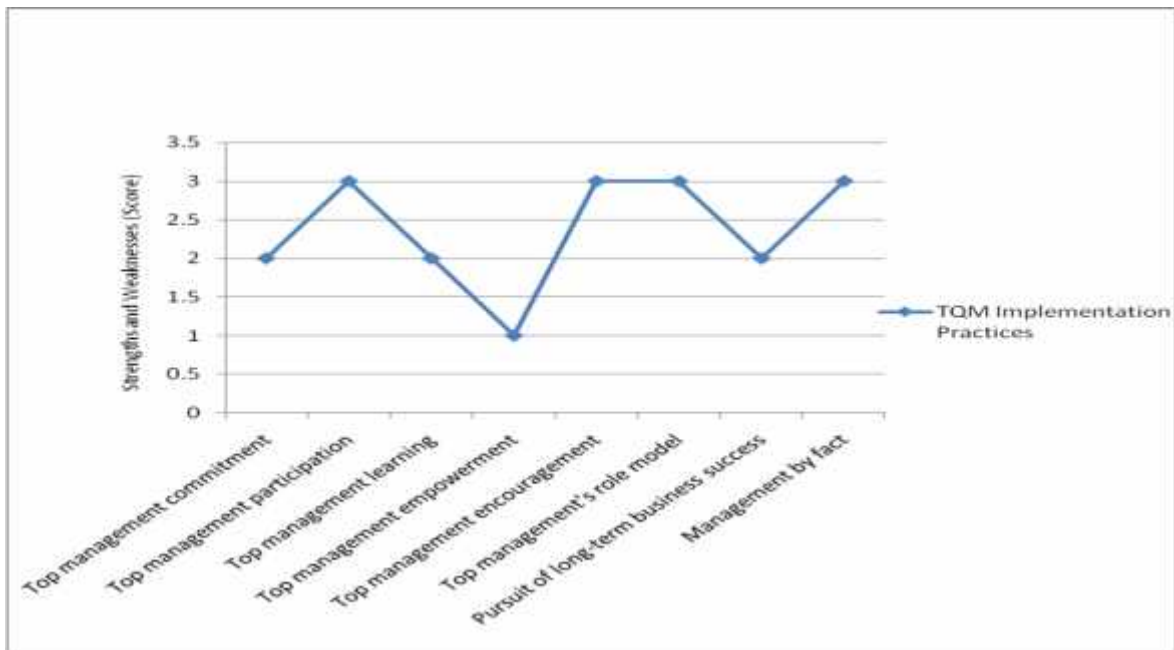
This subsection presents the weak areas of the firm's TQM implementation and the reasons leading to these weak areas. The assessment tool (see Appendix 2) was used to evaluate the

firm's TQM implementation. The weak areas identified could be used by the firm to further improve its TQM implementation; they were regarded as potential improvement possibilities. Note that the identification of these weak areas was on the basis of unbiased, honest, and fact-based judgments.

Leadership

Figure No. 4.2

Leadership

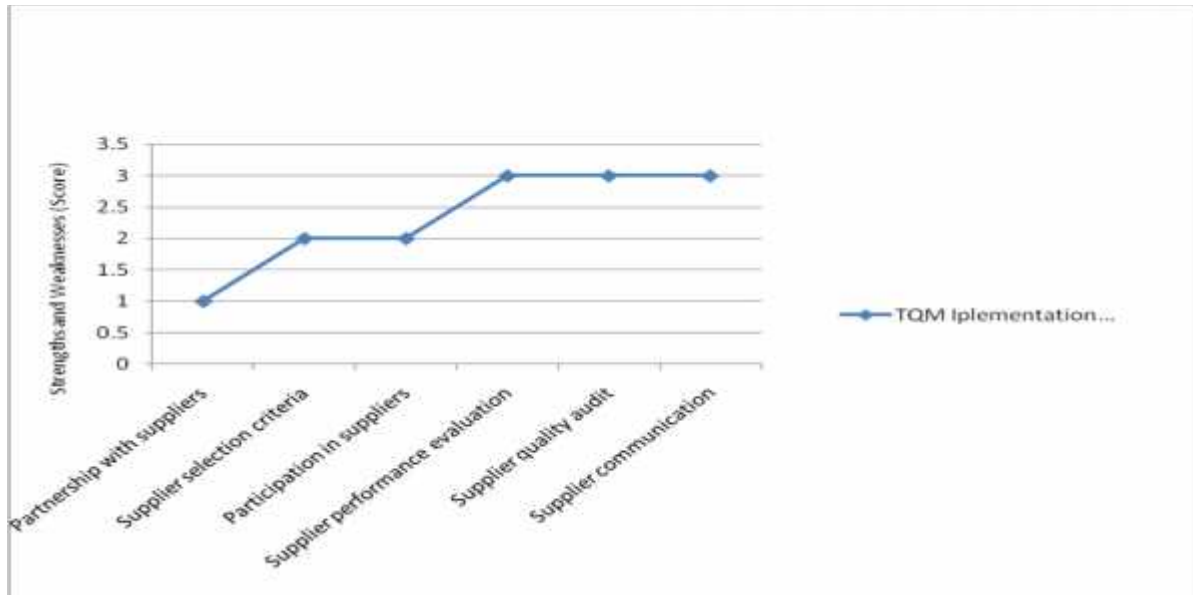


The above figure showed the TQM Implementation Practices with their relative score. It is seen that Top management Participation, Top management encouragement, and top management's role model has been scored as strong as indicated by number 3. Top management pursues long-term business success but focused instead on annual business success, which was their most important goal. Top management still viewed product quality as less important than cost. In addition, top managers often organized discussion meetings after quality problems had happened; how to prevent problems from happening was not given sufficient attention. Top managers were reluctant to accept or implement employee suggestions if money was needed for their implementation. The firm's many problems occurred due to its focus on immediate profits or short-term benefits.

Supplier Quality Management

Long-term partnership between the firm and its suppliers had not yet been established.

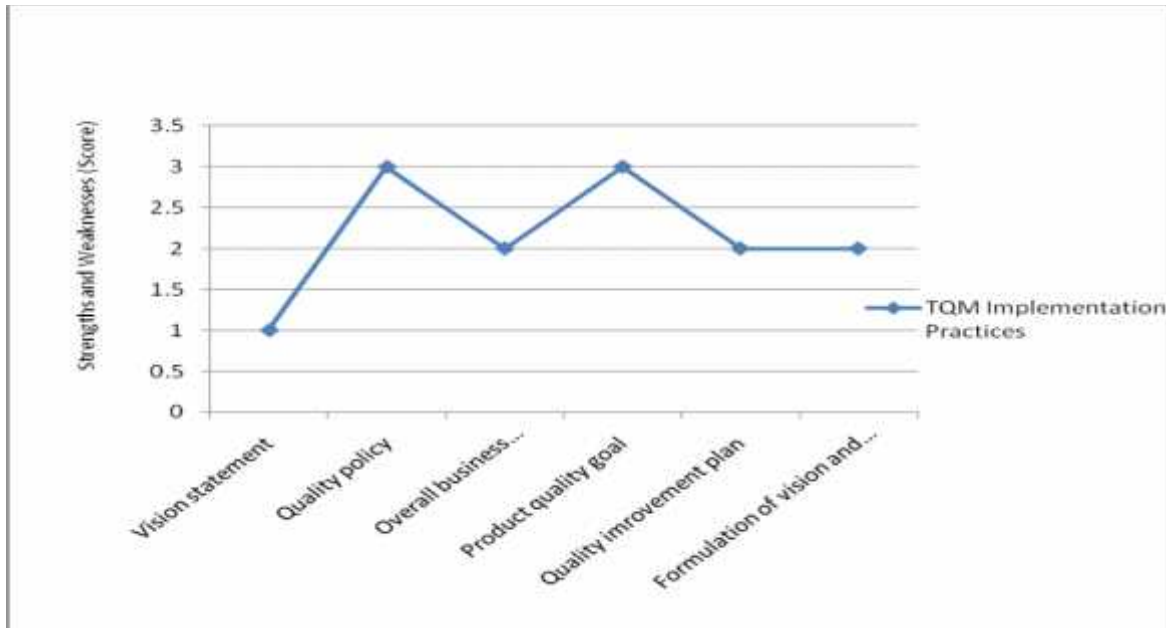
Figure No. 4.3
Supplier Quality Management



The above figure indicated that the firms supplier performance evaluation, supplier quality audit, and supplier communication was as according to the theory of Total quality management. There is little progress on supplier selection criteria and Participation in suppliers.

Vision and Plan Statement

Figure No. 4.4
Vision and Plan Statement



The above figure indicated that the firm had a long-term vision statement that had been drawn up several years ago. However, many employees were not clear as to what the vision statement was. In fact, the firm did not use it as a guide in formulating its business strategies. In this regard, the general manager did not have a clear long-term vision. The reason for this was that the general manager had been appointed by the administrative bureau to run the firm on a short-term basis, based on a contract. If he performed well, he would stay in the position longer. The decision made by the bureau in this regard was highly dependent on the firm's annual business performance. Therefore, the general manager focused on annual business performance rather than long-term business success. His target was to accomplish the annual business performance indices assigned by the administrative bureau. To do so, the firm had an annual policy statement to guide the firm in doing business. These annual policies varied year to year depending on the firm's internal and external environments.

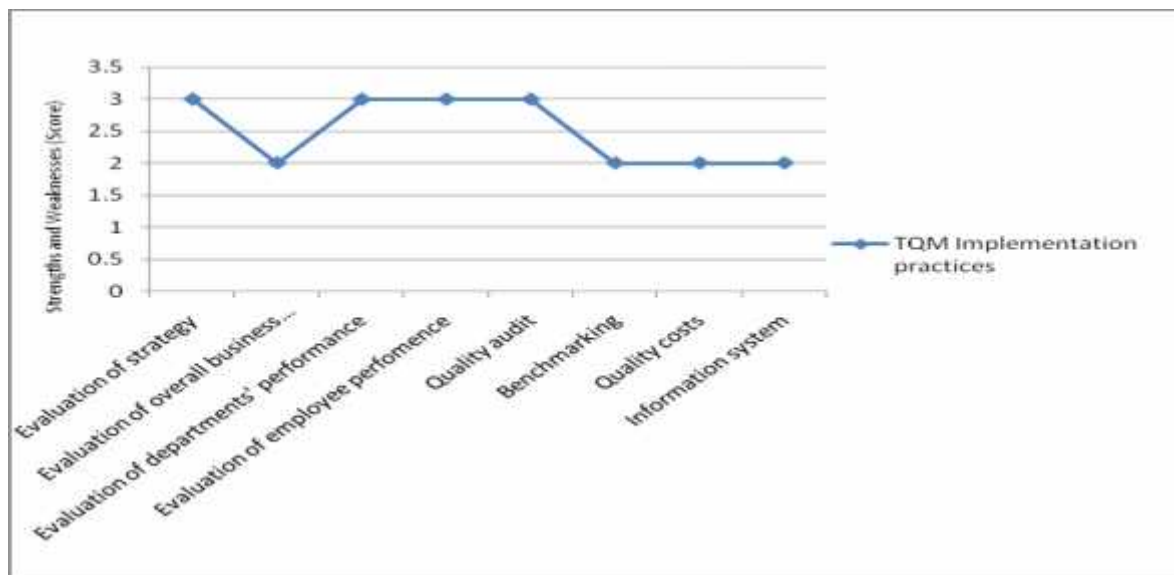
The firm did have little long-term overall business performance plans. Instead, it had only annual strategic business performance indices and product quality goals, which were formulated based on the assignments set up by the administrative bureau. This was because top management placed too much emphasis on short-term objectives. Although these plans were also presented to the workers' union for discussion, they would not be changed since they had been set up by the bureau. The firm did not have specific plans regarding which levels of employee and customer satisfaction should be reached.

The firm actually drew up its quality improvement plans in terms of quality problems that it had. The information used in making the plans was mainly from customers' complaints and the firm's different departments or workshops. It was evident that quality improvement plans were easily implemented if little money was required; it would be problematic if much money were needed. In this regard, the firm did not provide sufficient resources for implementing quality improvement plans. The primary reason for this was that the firm tried to achieve cost reductions to maintain the firm's profits. Thus, the firm's general manager could survive.

Evaluation

Figure No. 4.5

Evaluation



The above figure indicated that the firm tried to improve a number of job-related facets that might affect employee satisfaction, the employee satisfaction level as a whole remained unclear to some extent. In fact, the firm did not evaluate its employee satisfaction and did not have employee satisfaction data. In this regard, the issue of employee satisfaction did not receive much attention from the firm. This was because it was easy to recruit new employees from the labor market. Furthermore, the firm already had a redundant workforce, which it was considered a heavy burden.

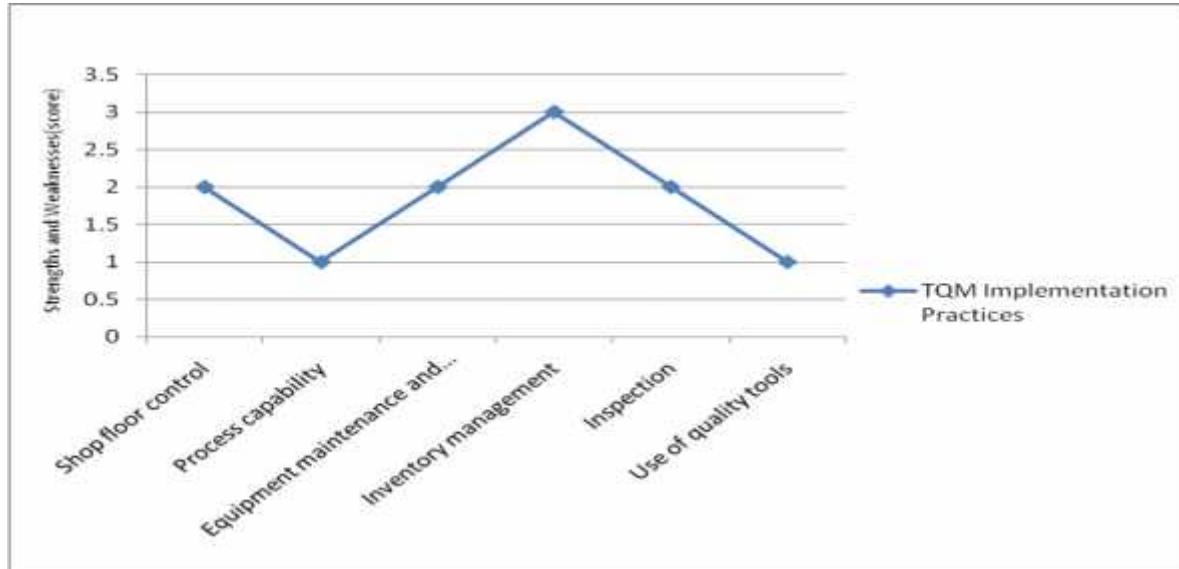
Competitive benchmarking with its major competitors was not conducted by the firm. Thus, TQM implementation and overall business performance of its main competitors remained unclear to a certain extent. Thus, the firm lost opportunities for further improvement of its quality of products and services. In fact, this practice had actually not caught top management's attention.

The data on appraisal costs and prevention costs were not available. The firm mixed these two types of quality costs with the firm's normal overhead expenses. Thus, it was not clear as to how much money was spent on appraisal and prevention.

The firm did not have an integrated computerized information system for collecting, processing, analyzing, disseminating, and storing relevant information. Information technology remained at a primitive level. Thus, it was difficult for different departments and workshops to share their information. The firm's major information flow was through handwritten documents. Therefore, working efficiency was low and some problems occurred due to the poor information system. The firm did not have such a computerized information system in place due to its pursuit of immediate profits and short-term benefits.

Process Control and Improvement

Figure No. 4.6
Process Control and Improvement



The above figure indicated that the firm did not pay sufficient attention to determining an appropriate temperature range, lighting intensity, noise level, and air quality. Such practices were due to the fact that these workshops wanted to reduce costs in order to increase profits.

The firm did not calculate its process capability index in order to understand whether a process was stable. Designers determined design specifications according to their previous experiences. If problems occurred during an inspection stage, then necessary actions would be taken. In this regard, the firm did not focus on preventing problems.

Effective equipment maintenance and innovation were not conducted by the firm. If equipment had problems, then it would be maintained or repaired. Due to insufficient equipment maintenance, a number of components could not be produced precisely. Thus, product quality was difficult to ensure. Every month there were a number of equipment problems that affected normal production. Concerning equipment innovation, some equipment was obsolete and could not meet production requirements.

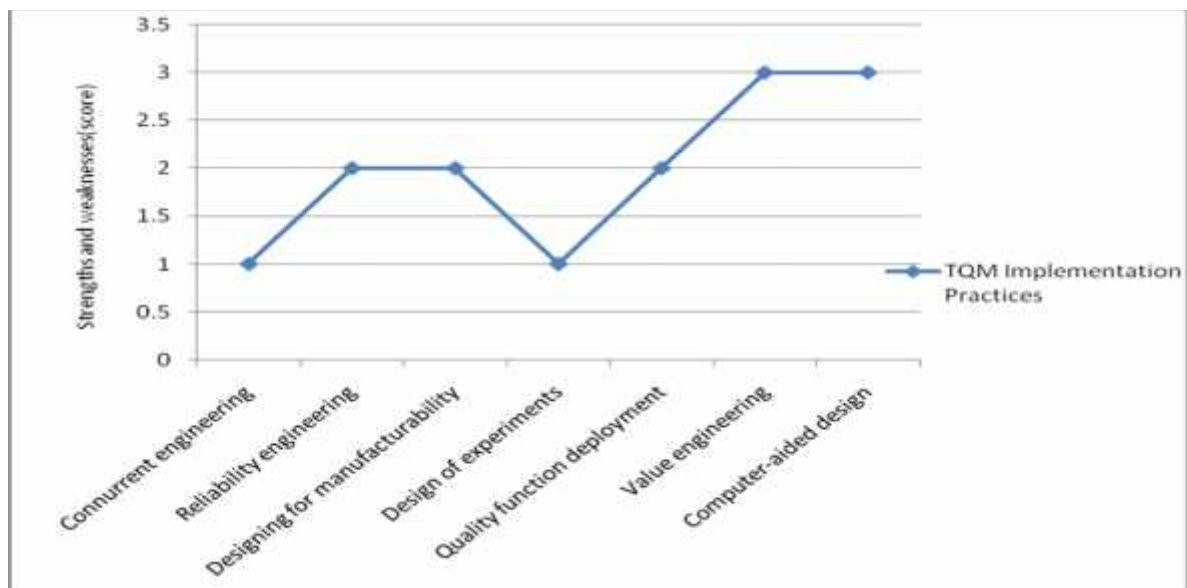
The firm did not pay sufficient attention to reducing various inspection activities. Instead, inspection was emphasized more than ever before. Every year the firm spent many resources

(e.g., human and capital) on conducting various inspection activities. In fact, many inspection activities were non-value added. High product quality could not be manufactured by after-event inspection.

The seven new QC tools had never been used by the firm due to a lack of understanding. Occasionally, the firm used the seven QC tools and statistical process control to solve quality problems; however, it did not use them extensively.

Product Design

Figure No. 4.7
Product Design



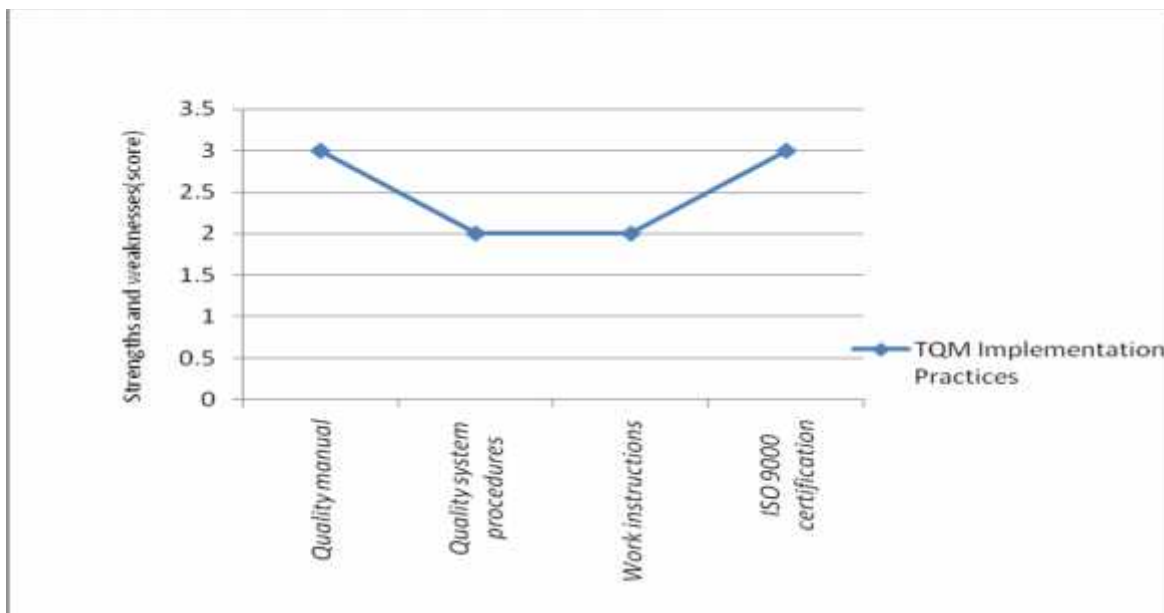
The above figure revealed that the firm did not effectively implement concurrent engineering for product design. Designing products through cooperation among different people from various functional departments, suppliers, or customers had not been achieved. Generally, only the R&D department was involved in product design and the technology department was in charge of auditing various drawings of product design. Contract review and design review were not sufficiently implemented. Thus, a number of quality problems occurred during production and with products in the field.

The firm did not focus on modular design (Reliability engineering) in order to make the product more producible. Designers tended to change product design drawings constantly. Thus, it was inevitable that more problems would occur during production or with products on the customer's site. Because the firm did not adopt modular design, it also took a long time to design products. Designers tried to continually change their design to lower production costs.

The technique of experimental design (design of experiments) for new product development was not used by the firm. Designers developed products based mainly on their previous experiences. In fact, the optimal design of the firm's products was not achieved; there was still much room for the firm to further improve its product design. Experimental design was not used because the designers did not understand how to use it. However, the firm is conducting value engineering and computer aided design.

Quality System Improvement

Figure No. 4.8
Quality System Improvement

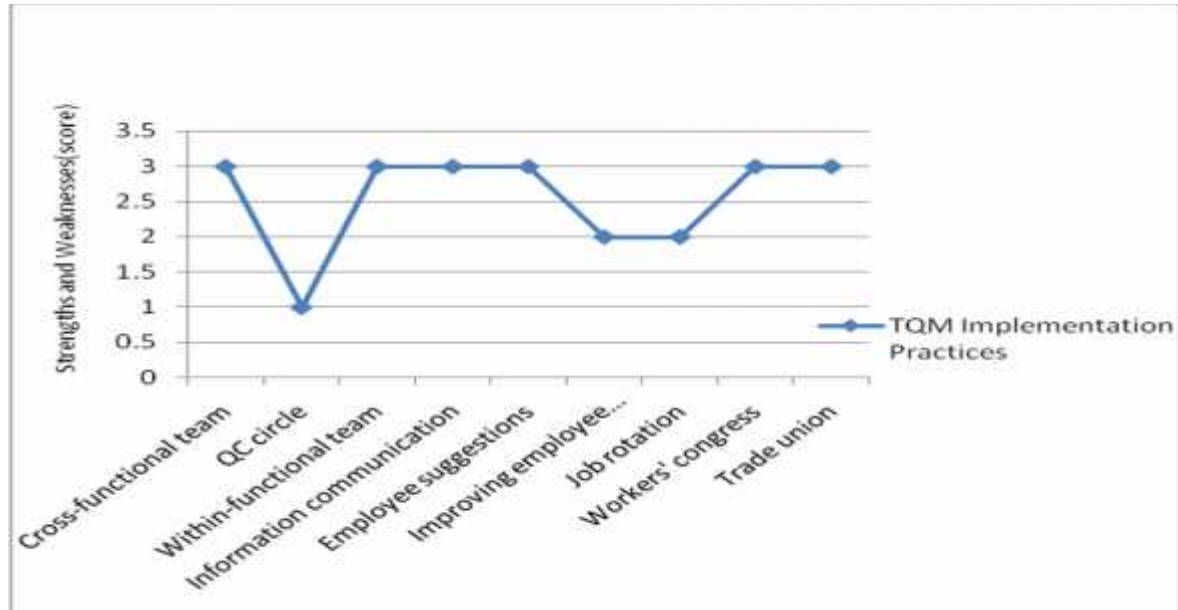


The above figure indicated that during the process of implementing its quality system documents, the firm did follow quality manual documents very well. There were little

practices of quality system procedures and work institutions. However, the firm has successfully received the ISO 9000 certification.

Employee Participation

Figure No. 4.9
Employee Participation



The above figure indicated that the firm did not have QC circles because it did not provide necessary rewards to employees to conduct QC circle activities, or a good environment to support them in doing so. The firm used Cross-functional team and within-functional team instead of QC circles.

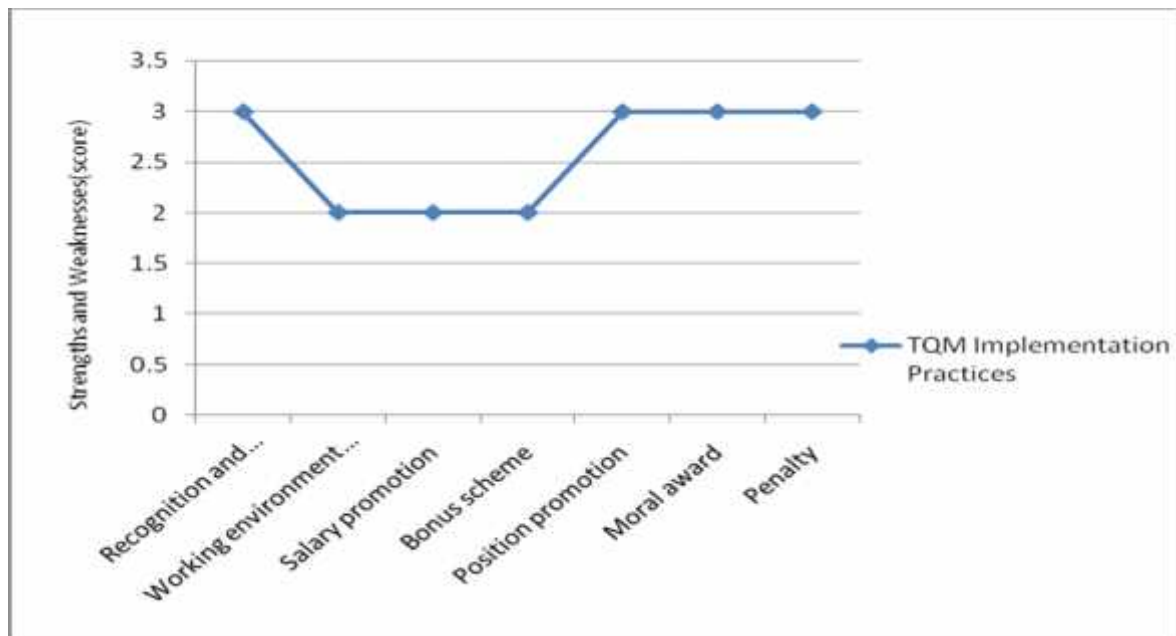
Employees did have intention of reporting their own working problems because they were not afraid of being fined or laid off. As a result, the firm gains many opportunities for quality improvement. In fact, employee working performance was highly related to employee suggestions that have been used for reward

The firm did not implement the system of job rotation as a whole as many working posts required operators with special qualification certification to do the work. Such regulations were stipulated by relevant governmental agencies. For example, lathe operators cannot operate cranes without qualification certification. Due to the money limitation, it was

impossible for the firm to send many employees to different special job training activities. Therefore, employees lacked multi-disciplinary skills. There is a strong practice seen on workers congress and workers union.

Recognition and Reward

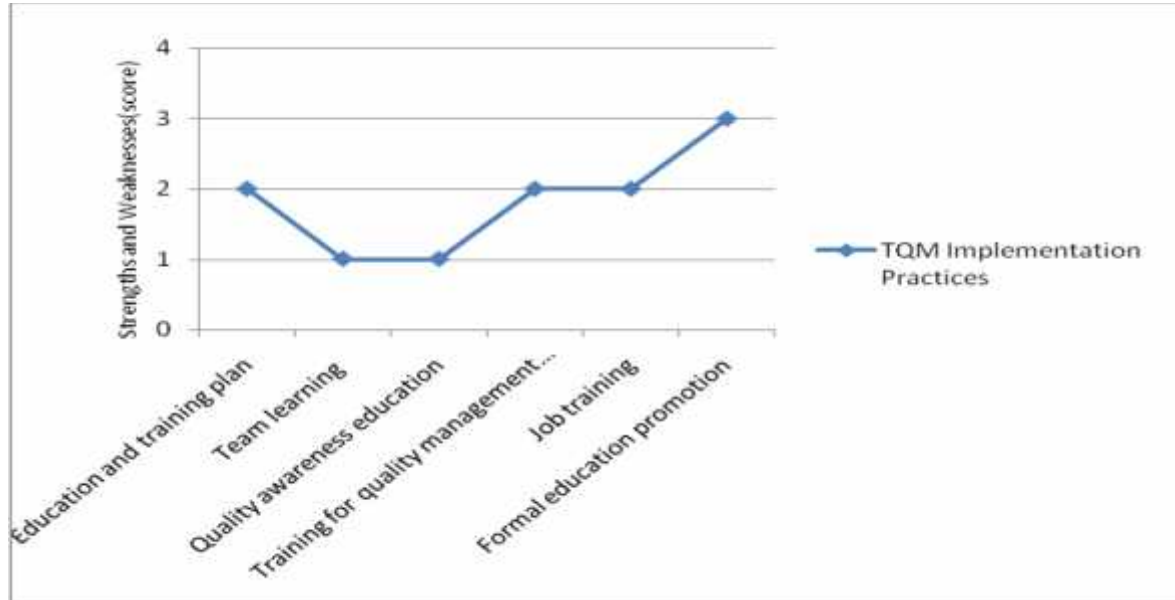
Figure No. 4.10
Recognition and Reward



The above figure reflected that the firm had already adopted the principle of “more work more pay”. However, the pay gaps among different employees were not very large. It was clear that the position promotion, moral award and penalty has been extensively used. However, there was a lack of working environment improvement, salary promotion, and bonus scheme. Thus, employees’ initiatives and potential could not be brought into full play. Due to the reason of low pay, more and more highly qualified employees left the firm.

Education and Training

Figure No. 4.11
Education and Training



The above figure indicated that the sufficient resources for employee education and training were not provided by the firm. Every year it spent only approximately Rs 0.2 million in this area. That amount of money was not enough; sometimes, employees had to pay the tuition fee themselves if they attended training courses. The firm did provide subsidies for employees attending formal education promotion programs.

Team learning in the firm was not effective. Members of within-functional teams or different production groups were reluctant to share their ideas, information, and knowledge. There was a strong tendency for these members to be on their guard against their colleagues. The reason for this was that members within one team or production group had competitive relations among themselves. They had a strong sense of crisis and were afraid of being laid off if they did not have unique skills. If everyone can do your work, then you are not valuable. There is a Nepalese proverb: The master will die of hunger because his apprentices can do his work.

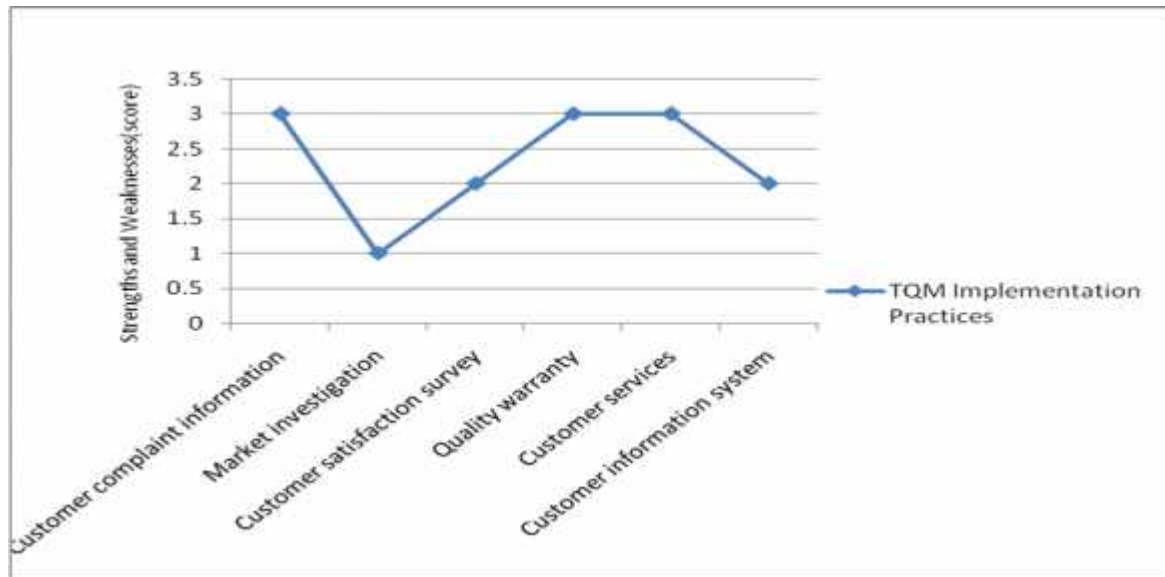
Quality awareness education was not sufficiently conducted even though top and middle managers often emphasized the importance of quality in various meetings. It is true that the

firm already conducted many quality awareness education programs, however, employees' quality awareness was still at a relatively low level. A number of employees still lacked of a strong sense of responsibility.

Training for quality management knowledge was not sufficient. The firm did not train employees on how to use the seven QC tools, the seven new QC tools, or statistical process control; nor did it train designers on how to use tools such as experimental design. Due to the lack of sufficient knowledge, these quality tools were not effectively used in solving quality problems.

Customer Focus

Figure No. 4.12
Customer Focus



The above figure indicated that the firm did not fully conduct market investigation. For example, designers hardly went out to collect information for improving product design due to the lack of money. Designers also rarely visited customers in order to understand the performance of their products on site. Thus, information sources used for product design were very limited. Designers only made use of customer complaint information and customer requirements specified in contracts for designing products. Customer expectations,

future requirements, and competitors' offerings remained unclear to a certain extent for designers. How to delight customers was not the focus of designing products.

The firm did not have customer satisfaction information on the quality of products and services from its competitors. Thus, customers' views on the firm's competitors were unclear. In fact, such information would have been valuable to the firm in further improving its quality of products and services. However, there is a great practice of quality warranty and customer service.

4.3.2 Overall Business Performance

The assessment tool presented in Appendix 2 was used to evaluate the firm's overall business performance. In fact, this performance reflected the effects of the firm's TQM implementation. The data of the firm's overall business performance could be used as input for formulating an effective improvement plan. Therefore, evaluating overall business performance was also an important part of TQM implementation.

Employee Satisfaction

The firm did not conduct employee satisfaction surveys in order to understand employee satisfaction levels. Thus, employee satisfaction as a whole remained unclear to a certain extent. During the process of conducting the case study, relevant interviewees were asked about their perceptions of employee satisfaction in the firm. The researcher presented these interviewees with facets that might affect employee satisfaction level. After these interviews were conducted, the researcher transferred these interviewees' perceptions into scores, which are listed in Appendix 2. These interviews indicated that employee pay was the most important factor affecting employee satisfaction.

Although employees in the firm did not earn a great deal they could, however, have their salaries and bonuses per month. If the whole of Nepal's machinery sector were taken into account, the investigated firm was doing well. In this regard, employees were satisfied. If compared with other industrial sectors or foreign-funded firms, the employees in the firm were not satisfied due to their relatively low pay. As a result, more and more qualified employees had left the firm to find well-paid jobs. It was very difficult for the firm to keep well qualified employees, which was a serious problem it faced. The second most important

factor affecting employee satisfaction was job security. Due to the long history of the planning economy in Nepal, the firm employed a huge reservoir of surplus labor power. During that time, the firm was not permitted to dismiss employees. With the establishment of the socialist marketing economy in Nepal, the firm now had the right to lay off surplus employees.

Product Quality

The firm did regularly measure various product quality indices, such as conformity rate for finished products, internal defect rate for processing parts and casting iron, internal failure costs, and external failure costs. Products manufactured by this firm had their own specific standards in which technical specifications and the parameters of performance, reliability, and durability were specified. Before finished products were delivered, their performance had to be examined; otherwise, they could not be delivered to customers. If finished products met the requirements of their technical specifications and performance indices, then the conformity rate for these products was 100%. Generally, the indices of reliability and durability could not be checked in advance but could be examined through practical application of products on site. In fact, the firm did get a number of complaints from customers about the reliability of their products, though rarely about its product durability. The internal defect rate for processing parts was measured in terms of processing time (time used to process defective components divided by time used to process all components).

In fact, the firm was one of the best in its industrial sector in Nepal. Its product quality enjoyed high reputation in the country. Therefore, its relative product quality was very high compared with that other firms (see Appendix 2). However, this does indicate that the firm's product quality was superior. Actually, there was still room for the firm to improve its product quality. A number of interviewees admitted that the performance, reliability, and durability of their products fell behind the advanced world-level products. Through the assessment of the firm's product quality, a number of areas that led to product quality problems were identified. These areas could be used by the firm to formulate an improvement plan in order to improve the firm's TQM implementation and product quality.

These weak areas are presented below.

Top managers did not pursue long-term business success. Instead, reducing immediate production costs and increasing immediate profits were their major concern. Improving product quality fell behind costs and profits. Products purchased from suppliers occasionally had quality problems that could not be completely detected by incoming inspection. Such defects would cause quality problems during production or operations in customers' fields. This was due partly to the fact that the firm selected its suppliers based mainly on price rather than quality.

Management means was backward. From time to time, employees read handwritten documents incorrectly because different people had different styles of handwriting. A number of product quality problems occurred due to handwritten documents. Employees' quality awareness was not very high and employees still lacked a strong sense of responsibility. In addition, a number of employees were short of sufficient skills needed to perform their jobs well.

Some production equipment was obsolete and could not meet production requirements. The firm did not innovate its production equipment since it was short of capital and did not pursue long-term business success.

Customer Satisfaction

Customer satisfaction surveys were not regularly conducted to understand customers' views on the firm's quality of products and services. The information obtained from customer feedback forms and the number of customer complaints received was the major sources for the firm in understanding customer satisfaction level (see Appendix 2). Through conducting the assessment of customer satisfaction, the firm's quality problems of products and services were identified. Such information could be used in formulating an improvement plan to improve product and service quality. Customer complaints about product and service quality were identified as follows:

Customers had complaints about product quality related to painting, welding, and other outside appearances; oil leakage from speed reducers; broken axles of belt conveyors; vibration, and noise. Concerning customer complaints about service quality, the firm had the

following problems: Necessary parts were not packed for delivery; a number of small parts were not fixed in packing boxes; electric motors were not protected against water and moisture; packing lists were not complete; packing materials had quality problems; and packing quality was not good enough. The major reasons leading to these problems of products and services were recognized as: Low quality raw materials from suppliers, obsolete production equipment, and employees' low sense of responsibility.

Strategic Business Performance

The firm regularly measured its annual sales, sales growth, profits, market share, and exports. Of the five indicators of overall business performance, only market share increased continuously. The other four indicators decreased almost year by year. Such information could be used by the firm to take appropriate actions in order to increase its strategic business performance.

4.4 Four Categories of Improvement Possibilities

Through the assessment of the firm's TQM implementation and overall business performance, its weak areas of TQM implementation were identified. These weaknesses could be used as improvement possibilities for further improving the firm's TQM implementation. Based on a thorough investigation of these improvement possibilities, they can be categorized into four improvement possibilities: Structurally impossible, temporary barrier, ineffective, and feasible. The deputy general manager was involved in assisting the researcher to categorize these four improvement possibilities. The detailed explanations and analyses of these four categories are described below:

Structurally Impossible Improvement Possibilities

Structurally impossible improvement possibilities are very difficult for the firm to implement under the current situation. The major reason causing structurally impossible improvement possibilities were that the firm's top managers did not pursue long-term business success; immediate short-term profits were their major concern. Due to the institutional system, the general manager was contracted to run the firm under the contract system. The firm's administrative bureau behaves as the principal representing state ownership. The top managers were assumed to have some delegated rights in their

operations, but should represent the owner's interest. Every year, the administrative bureau assigned indices of overall business performance to the firm. Profit was the most important index in evaluating the performance of the general manager, whereas annual sales volume was the second.

In fact, profit was the veto index, which played a 40% role in evaluating top management performance. As a result, the general manager had to try his best to accomplish these indices. If he did, he could be financially rewarded by the administrative bureau. If he could not achieve these indices, he would be financially punished or would risk being dismissed by the bureau. Under such a system, it was impossible for the general manager to pursue long-term business success. His major focus was to concentrate on annual business success. Profits and annual sales volume were the primary targets. However, to reach these targets was not an easy task under the current situation. Due to the slack market in Nepal, the firm did have some difficulties in achieving the target of annual sales. In order to realize this index, the firm had to sell products at lower price, sometimes suffering losses.

As a consequence, the firm had difficulties in realizing its profit target. In order to make profits, the firm had to cut money expenditures. As a result, further development of the firm was hindered. Thus, it was not difficult to understand why some improvement possibilities were very difficult to implement currently. Of the previously identified improvement possibilities, structurally impossible improvement possibilities are listed as follows:

- ✓ Pursuit of long-term business success;
- ✓ Long-term partnership with suppliers;
- ✓ Long-term vision statement;
- ✓ Long-term overall business performance plan;
- ✓ Implementation of improvement plans;
- ✓ Computerized information system;
- ✓ Improvement of working environment on shop floor;
- ✓ Equipment maintenance and innovation;
- ✓ Sufficient resources for employee training.

However, with the deep reform of state-owned firms in Nepal, such structurally impossible improvement possibilities would be implemented if top managers would pursue long-term business success.

Temporary Barrier Improvement Possibilities

There were a number of improvement possibilities that could be implemented in the near future adopting step-by-step approach. First, employee empowerment could be implemented.

Currently, the firm organized all activities according to the firm's various rules, regulations, and quality system documents. Every employee had his or her functions and duties, having to do things according to such regulations and procedures. Otherwise, the firm would have trouble. However, with the continuous improvement of employee education, employee commitment and employee skills, employee empowerment would be implemented in the future, though it would take some time to fully implement it.

Second, Nepal's present situation was uncertain, with much turbulence. Employees had a strong crisis awareness for their future-they were truly afraid of being laid off. At present, more and more employees were being laid off due to the fact that many firms adopted the policy of laying off redundant employees to increase profits. Thus, employees had a strong consciousness for protecting themselves. As a result, they declined to report their own working problems that were caused by themselves. However, after all redundant employees were laid off and the firm's business went well, employees would be more willing to report their working problems. They would also have more chances to learn different skills for performing different jobs.

Third, it was possible that the firm would try to increase various inspection activities in the future. The approach to reducing inspection activities should be undertaken step by step.

Fourth, the deputy general manager did not have confidence in using the seven new QC tools in practice, as he felt they were too complicated to be used at this moment. The seven new QC tools should be implemented in the future after employees accept sufficient training in their use.

Ineffective Improvement Possibilities

It was ineffective for the firm to organize QC circle activities. In fact, the firm's different departments and workshops had already formulated a number of within-functional teams. These teams, instead of QC circles, were used to solve quality management problems. In addition, production employees had their own working tasks according to their job descriptions. If they could not finish these tasks, they would have less pay. Therefore, employees only paid sufficient attention to producing more yields. In such an environment, it was ineffective to organize QC circle activities.

Feasible Improvement Possibilities

Concerning other improvement possibilities, the general deputy manager admitted that these did not receive much attention from the top management team. It is better to say that these improvement possibilities were ignored by the firm. Such improvement possibilities could be implemented by the firm under the current situation. These feasible improvement possibilities are listed as follows:

1. Supplier selection criteria should be changed in order to ensure that purchased materials have less (or no) quality problems. The quality of purchased products should be regarded as the most important factor in selecting suppliers. Total costs (e.g., incoming inspection, internal failure costs, external failure costs, and late delivery) should be taken into account in selecting suppliers.
2. Data on appraisal costs and prevention costs should be collected and analyzed in order to understand how much money was spent on appraisal and prevention. Such information can be used in seeking solutions to reducing unnecessary costs.
3. Various internal job training courses should be effectively organized in order to make employees perform their jobs better. Experienced employees from different departments or workshops can be training lecturers.
4. Team learning should be further improved by arranging for skillful employees to report their working experiences, rotating team members to present their good ideas during the process of team activities, and rewarding team members who are willing to share their knowledge with other members.

5. Quality awareness education should be further emphasized in order to increase employees' quality awareness and sense of responsibility.
6. The pay gap should be further widened in order to improve the initiatives of well performing employees, well qualified employees, and sales personnel. Employees who make large contributions to the firm deserve to earn more.
7. Competitive benchmarking should be conducted in order to understand competitors' offerings. Such information will be valuable for the firm in improving product design, product quality, and service quality.
8. In-depth market investigations should be conducted in order to obtain customers' real expectations and potential needs. It is valuable to obtain customer satisfaction information on the quality of products and services from the firm's competitors. Such information can be used for product design and quality improvement.
9. Employees should accept training on how to use the seven QC tools and statistical process control in practice. Designers should accept training on how to use experimental design in product design.
10. The seven QC tools should be used extensively in analyzing and solving quality-related problems.
11. Experimental design, concurrent engineering, and modular design should be used in improving product design.
12. The evaluation of employee satisfaction should be conducted regularly. Such information can be used by the firm to further improve its employee satisfaction.
13. Statistical process control should be used in order to control the production process. In addition, process capability should be calculated in order to provide sufficient information for designers to determine design specifications.
14. Quality system documents should be further improved according to the firm's current practices and the ISO 9001 requirements. The firm should change its quality system documents in order to ensure "write what they do and do what they write".

4.5 Formulation of Improvement Plan

The 14 improvement possibilities mentioned above could be used by the firm to formulate its improvement plan. Due to its limited resources, the firm could not implement these improvement possibilities at the same time but had to choose some critical improvement

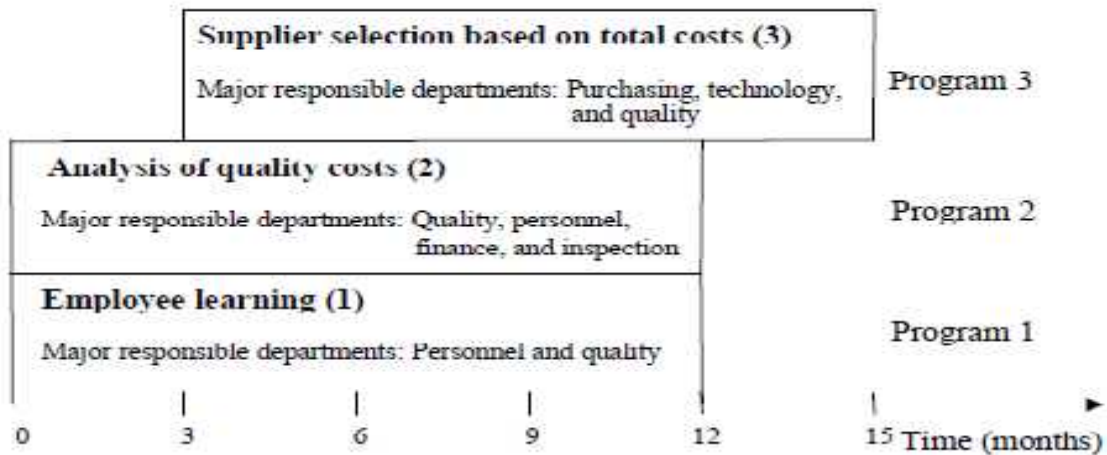
possibilities essential to the firm. More importantly, the firm could implement them in practice. Which improvement possibilities to be implemented should be based on a thorough analysis of these feasible improvement possibilities and the firm's available resources. In addition, time schedules and major responsible departments involved in implementing the improvement plan should also be determined. Thus, the plan might be more practical and its implementation easily ensured. In order to reach this aim, the researcher consulted with the deputy general manager concerning how to formulate a more effective improvement plan. Based on the guidance in formulating an improvement plan presented in the TQM implementation model, the targeted improvement areas of the firm's overall business performance were used in ranking all the feasible improvement possibilities.

In this firm, it was obvious that the first priority was given to increasing profits. Thus, increasing the firm's profits was used to prioritize the 14 feasible improvement possibilities. Note that the deputy general manager was involved in ranking these improvement possibilities in terms of their potential effects of these feasible improvement possibilities on improving the firm's profits. The ranking was based on the deputy general manager's perception and understanding of these feasible improvement possibilities. Note that the research findings obtained from the questionnaire survey could not be used in ranking these improvement possibilities, as they only showed whether TQM elements have effects on overall business performance. In addition, the questionnaire findings did not indicate the amount of contribution each TQM element makes. Furthermore, the questionnaire survey findings showed that a number of hypotheses were not confirmed by the data. Actually, these TQM elements do have effects on overall business performance if implemented effectively.

In terms of the firm's available resources, it was better to implement the first five ranked improvement possibilities. The other nine would be left for the next stage of improvement. These five possibilities were then transferred into three programs. Thus, the formulated improvement plan is composed of three programs: Employee learning, analysis of quality costs, and supplier selection based on total costs. The first two programs will start at the same time; the third will start three months later. Figure 4.3 displays the time dimension and major responsible departments involved in implementing this improvement plan, which was

formulated on a yearly basis. In other words, within one year's period, implementing this improvement plan is the firm's focus of TQM implementation. After the three programs are practically implemented, their effects and immediate results should be periodically monitored and checked. Immediate actions will be taken to ensure that the improvement plan can be effectively implemented. After one year of implementing the improvement plan, the firm should formulate another improvement plan for the next year's implementation. The lessons learned and experiences gained from this year will be used in formulating the next year's plan. It is a never-ending process. It is worthy to note that having a better understanding of these feasible improvement possibilities and the firm's available resources are the primary determinants in formulating a more effective improvement plan. The detailed explanations of this improvement plan are presented in the following paragraphs.

Figure 4.13
Three Programs of the Improvement Plan



Employee Learning (Program 1)

This program consists of three activities: Quality awareness education, internal job training, and team learning, which are explained as follows:

First, quality awareness education will be conducted in order to improve employees' quality awareness and sense of responsibility. It should be conducted on a regular basis (e.g., one time per month). All employees should accept such education. It can be expected that employees' sense of responsibilities will be improved; consequently, fewer quality problems will occur. Note that the contents of quality awareness education are essential to the success

of this activity. It will be more effective to use facts to teach employees rather than only words. For example, the fact that money is lost each year due to employees' low quality awareness and lack of a sense of responsibility is a good example to teach employees. The effects of quality awareness education should be regularly monitored in order to continually improve the effectiveness of this activity.

Second, various internal job training courses will be organized to improve employees' skills. Competent employees from different departments or workshops can be asked to give training lectures. Thus, training costs will be reduced enormously. It is not always the case that external job training is better than internal job training, or that external lecturers are better than internal ones. If qualified lecturers cannot be found within the firm in some cases, external trainers can be invited to give training lectures. Before conducting internal job training, it is essential to understand employees' skill levels. Note that different employees performing different jobs with different skill levels should accept different training. In this regard, internal job training courses should be well developed; otherwise, the training cannot be effective.

Third, the effectiveness of team learning will be further improved by arranging for skillful employees to report their working experiences, rotating team members to present their good ideas during the process of team activities, and rewarding team members who are willing to share their knowledge with other members. Such kinds of "compulsory" sharing ideas will be very effective.

To ensure the success of Program 1, two departments (personnel and quality) are mainly responsible for its implementation. Other departments or workshops should cooperate with these two major responsible departments. The personnel department is in charge of making the detailed time plan for conducting this program and drawing up reward policies to encourage team members to share their knowledge with other members. The quality department is responsible for selecting suitable personnel to give training lectures or present their working experiences. Program 1 will be initially conducted for one year. During the process of one year's implementation, the firm should monitor immediate results so as to take suitable action to ensure the success of this program. If Program 1 produces the expected results, the firm should integrate it into the firm's existing management systems.

Thus, the system can ensure that employee learning can be continuously implemented. If this program does not produce the expected effect, then a new improvement program will be formulated on the basis of a careful examination of the one year's implementation of Program 1. Thus, the new improvement program will be more effective.

Analysis of Quality Costs (Program 2)

Various data related to quality costs will be collected and analyzed. Actually, there are four categories of quality-related costs: Internal failure, external failure, appraisal, and prevention. Internal failure costs are associated with defects found prior to transfer of products to the customer. Internal failure costs include, for example, scrap, spoilage, defectives, waste, rework, failure analysis, scrap and rework supplies. External failure costs are related to defects found after products are shipped to the customer, such as warranty charges, complaint handling, returned materials, and allowances. Appraisal costs are incurred in determining the degree of conformity to quality requirements. These costs include those caused by incoming inspection, in-process inspection, final inspection, and maintenance of testing equipment. Prevention costs are associated with those caused by quality planning, process control, quality audit, supplier quality assessment, and training. Note that to have data on quality-related costs is not enough to improve quality and reduce costs. Without carefully investigating the real causes leading to quality costs, actions cannot be effective and chronic deficiencies cannot be reduced. There are two ways of analyzing the data of quality costs. The first is to identify different segments of quality costs and rank these segments in terms of their sizes (amounts of money).

In fact, the costs of quality do not exist as a homogeneous mass. These segments are unequal in size, and a relative few account for the bulk of the quality costs. The second way to analyze the data is to investigate all reasons leading to quality costs and ranks these in terms of their contributions to quality costs. Each segment of quality costs can be traceable to specific causes. Thus, different reasons leading to quality costs can be identified, especially those vital few reasons. In order to analyze data efficiently, Pareto analysis and cause-and-effect diagram should be used. It is worth noting that the largest segment of quality costs and the reason leading to the largest proportion of quality costs should be used as the primary input in formulating an improvement action. Such an action can be implemented in order to

effectively reduce quality costs. Thus, it can be expected that the firm's profits will be improved. To ensure the success of this program, the departments of quality, personnel, finance, and inspection are mainly responsible for implementing this program. Other departments or workshops should cooperate with these major responsible departments. This program is designed for one year. After one year's trial, the firm should standardize its procedures through establishing a formal quality costing system to ensure that collection and analysis of quality costs is the normal life of the firm's evaluation activities.

Supplier Selection Based on Total Costs (Program 3)

The firm's many quality problems and losses were incurred by poor quality of purchased materials due to the fact that the firm selected suppliers based mainly on purchasing price rather than product quality. Of course, it is normal practice to balance between price and quality in order to pursue optimal purchasing. It is impossible for the firm to select its suppliers in terms of only one factor-quality. The firm's primary goal is to achieve the profit target set by the administrative bureau. Thus, supplier selection based on total costs should be adopted by the firm. From the analysis of quality costs (Program 2), the amount of quality costs caused by poor purchased products can be identified. This information can be used in optimizing supplier selection by balancing between quality and price. To do so, the firm can reduce total costs by selecting suitable suppliers. As a consequence, the firm's profits will be enhanced. In fact, it will take some time to collect and analyze the data of quality costs. Therefore, the program of supplier selection based on total costs will start three months later than that of analysis of quality costs. This program will be initially implemented for one year. Then, its effects on improving profits will be evaluated. If this program produces good results, the firm should continually implement it. If it does not have the expected effect, reason analysis should be conducted. A new improvement program concerning selecting suppliers will then be formulated, on the basis of the information obtained from the one year's implementation of supplier selection based on total costs. Note that external quality losses may not be identified in one year, but are most probably identified after that time. Therefore, the yearly evaluation of the effects of implementing this program should take this factor into account. The departments of purchasing, technology, and quality will be mainly responsible for implementing this program. Other departments or workshops should cooperate with these three major responsible departments.

During the process of formulating this improvement plan, the deputy general manager was personally involved. In fact, he agreed that this improvement plan would be implemented by the firm in practice. It should be noted that this plan was formulated on the basis of the 14 feasible improvement possibilities, the targeted improvement area of the firm's overall business performance (profits in this case), and the firm's available resources.

4.6 Major Findings

Based on the evaluation, the strengths and weaknesses of the firm's TQM implementation and overall business performance were identified. The firm's current TQM implementation practices showed that it did not implement the full package of the TQM implementation model. It is better to say that this firm only implemented part of TQM, or that it was on the journey to full-fledged implementation of TQM. The weaknesses of the firm's TQM implementation and overall business performance provided opportunities for the firm to improve its TQM implementation. Based on these weaknesses, the firm's targeted improvement area of overall business performance, and the firm's available resources, an improvement plan was formulated. The firm's deputy general manager agreed that the firm would implement this improvement plan in practice. Thus, it can be concluded that this TQM implementation model can be used to evaluate the firm's TQM implementation and overall business performance, identify strengths and weaknesses therein, and assist the firm in formulating the improvement plan. Therefore, the TQM implementation model developed in this study is applicable to this firm.

Can this TQM implementation model be used in other Nepalese manufacturing firms? In fact, the case study was conducted in only one Nepalese state-owned manufacturing firm. Strictly speaking, the generalization was limited. However, it was safe to assume that no firms have implemented the full package of the TQM implementation model in practice. Firms' weak areas of TQM implementation and overall business performance can always be identified by comparison with this TQM implementation model. Weak areas can be used by firms to further improve their TQM implementation. Thus, the conclusion obtained from the case study can be generalized to other manufacturing firms in Nepal. Therefore, the TQM implementation model developed in this study is applicable to all Nepalese manufacturing firms.

The case study further shows that this TQM implementation model can be used to benchmark firms' continuous improvement, self-assess their quality improvement efforts, and measure their progress over time. Through using this model, firms can quickly identify which areas urgently need improvement. Thus, resources can be allocated more wisely. In fact, TQM implementation is a systematic approach. Different firms have different characteristics, histories, and backgrounds; adopt different technologies; have different TQM implementation maturity; serve different markets with different products; and employ people from different education levels. Different firms should adopt different approaches to TQM implementation on the basis of their own situations. No universal standard of TQM implementation exists. Firms should not follow the practices presented in this TQM implementation model strictly; when they start using it, they should combine their uniqueness with the practices of this model and consequently develop their own models and ways to excellence. Thus, firms can optimize the use of this model by blending with it and applying it to their own situations. Through this, their own models can suit their situations better. It is very important that firms adopt TQM practices that are valuable to their own specific requirements. Additionally, firms need to develop their own measurement systems that can better measure employee satisfaction, product quality, customer satisfaction, and strategic business performance. Their own measurement systems can better fit their situations.

This case study also provides an example of how to use this TQM implementation model in practice. Firms that want to use this model can take this case study as an example. It should be noted that top management commitment is the most important prerequisite; without it, it is impossible to successfully implement this model in practice. To ensure the success of using the TQM implementation model, firms should understand their TQM implementation and overall business performance. Otherwise, weaknesses in these areas cannot be identified and effective improvement plans cannot be formulated. After improvement plans have been formulated, firms should implement them in practice, observe and check results, investigate and analyze the results, formulate new improvement plans again, and restart implementing new plans. In fact, implementing TQM is a continuous improvement process. It is a never ending journey. Implementing this model does require patience, tenacity, and commitment

from people at every level in firms. It is worth noting that there are no quick fixes. It will take some time to see the effects of implementing this model.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Summary

In the field of total quality management, confusion was raised worldwide with the TQM concept and the effects of TQM implementation. In fact, much research dealing with the concept of TQM has been conducted. Different researchers have adopted different definitions of TQM; thus far, it has come to mean different things to different people. Concerning the effects of TQM implementation, different researchers have different findings. A number of researchers concluded that TQM implementation has effects on firms' business performance; whereas others stated that it does not lead to improvements in firms' business performance. Conflicting research findings have thus been reported surrounding the effects of TQM implementation. Similarly, conflicting results concerning the effects of TQM implementation on firms' business performance were also found in Nepalese manufacturing firms. After the literature related to TQM implementation in Nepalese manufacturing firms was studied, it became evident that no large-scale empirical research dealing with the effects of TQM implementation on firms' overall business performance had been systematically conducted. In addition, no research has been conducted for developing a TQM implementation model that can be used by Nepalese manufacturing firms to improve their TQM implementation efforts. The lack of sufficient guidelines to assist firms' TQM implementation has led to a number of unsuccessful TQM implementations in Nepal. Thus, the major objectives of this study are:

1. To obtain the effects of TQM implementation on overall business performance in Nepalese manufacturing firms;
 2. To obtain a TQM implementation model for Nepalese manufacturing firms.
- In order to achieve the two research objectives, five research questions were proposed as follows:

) *What is TQM?*

) *What is overall business performance within TQM?*

-) What are the effects of TQM implementation on overall business performance in Nepalese manufacturing firms?*
-) What kind of TQM implementation model should be developed in order to guide Nepalese manufacturing firms in implementing TQM?*
-) How can this TQM implementation model be demonstrated in practice?*

This study started with an extensive review of TQM literature from quality gurus (Deming, Juran, Crosby, Feigenbaum, and Ishikawa), the three quality award models (the Deming Prize, the European Quality Award, and the American Malcolm Baldrige National Quality Award), and the others conducting research in the field of TQM. Thus, the concept of TQM adopted in this study was defined as: A management philosophy for continuously improving overall business performance based on leadership, supplier quality management, vision and plan statement, evaluation, process control and improvement, product design, quality system improvement, employee participation, recognition and reward, education and training, and customer focus.

Finally, it is necessary to review this study in light of the five research questions. The first question, “What is TQM?” was answered on the basis of the extensive literature review. The defined concept of TQM was used throughout this study, which laid a solid foundation for conducting this research. The second question, “What is overall business performance within TQM?”, was also answered on the basis of the extensive literature review. The third question, “What are the effects of TQM implementation on overall business performance in Nepalese manufacturing firms. The effects of TQM implementation and different TQM constructs were identified. The fourth question, “What kind of TQM implementation model should be developed in order to guide Nepalese manufacturing firms in implementing TQM?”, was answered by developing a TQM implementation model, which combined the existing TQM theory, the questionnaire survey findings, and the ten structured interviews in Nepalese manufacturing firms. The fifth question, “How can this TQM implementation model be demonstrated in practice?”, was answered by conducting a case study in a Nepalese state-owned manufacturing firm. The case study showed that the TQM implementation model developed in this study is applicable to this typical Nepalese

manufacturing firm. In summary, the five research questions were answered and the two research objectives achieved through conducting this study.

5.2 Conclusions

A number of conclusions have been obtained from this research. Thus, a quality management theory related to Nepalese manufacturing firms has been developed.

First, the instruments for measuring TQM implementation and overall business performance are reliable and valid, and can be used by other researchers to test the effects of TQM implementation on overall business performance. The reliable and valid instruments can also be used in testing the time dimension of TQM implementation.

Second, several conclusions have been obtained from testing the two theoretical models, which are listed as follows: (1) TQM implementation has positive effects on employee satisfaction, product quality, customer satisfaction, and strategic business performance; (2) Leadership has positive effects on employee satisfaction and strategic business performance; (3) Employee participation, recognition and reward have positive effects on employee satisfaction; (4) Education and training does not have a positive effect on employee satisfaction; (5) Supplier quality management, evaluation, product design, and quality system improvement do not have positive effects on product quality; (6) Vision and plan statement, process control and improvement have positive effects on product quality; (7) Quality system improvement has a positive effect on strategic business performance; (8) Customer focus has a positive effect on customer satisfaction; (9) Employee satisfaction has positive effects on product quality and customer satisfaction; (10) Product quality has positive effects on customer satisfaction and strategic business performance; and (11) Customer satisfaction does not have a positive effect on strategic business performance.

Third, the case study reveals that the TQM implementation model developed in this study is applicable in practice. This model can be used by Nepalese manufacturing firms to improve their TQM implementation efforts. The case study further shows that this TQM implementation model can be used to self-assess firms' quality improvement efforts and measure their progress over time. Through using this model, firms can quickly identify

which areas urgently need improvement. Thus, the resources can be allocated more wisely and more effective improvement plans can be formulated.

5.3 Recommendations

In an exploratory study such as this, recommendations for future research would address the issues generated from this study. Based on these findings, future research may start from a relatively higher level of knowledge.

1. First, a replication of this study would be helpful in reexamining the validity of its findings. Further empirical studies using larger sample sizes, greater geographical diversity, and firm type diversity would be helpful in validating specific parts of the theoretical models proposed in this study.
2. Second, subsequent research needs to be engaged in the development of more valid and reliable operational definitions for the proposed constructs, overcoming the limitations posed by the data source used in this study. For example, more categories could be developed in order to score the responses for strategic business performance. The data of employee and customer satisfaction would be obtained from employees and customers, respectively, rather than from respondents.
3. Third, the relationships found in this study would be investigated in different countries to test whether they go in the same or different directions.
4. Fourth, a set of longitudinal studies would be very valuable in studying the time dimension of TQM implementation.
5. Fifth, more structured interviews would be conducted in different kinds of Nepalese manufacturing firms in order to continuously improve the TQM implementation model. Thus, model could better meet the requirements of different Nepalese industries.
6. Sixth, an in-depth case study would be conducted in a Nepalese manufacturing firm to gain more insight into using this TQM implementation model in practice. Finally, the influence of external environment could be studied in order to explore how external environment affects firms' TQM implementation.

BIBLIOGRAPHY

- Ahire, S.L., Golhar, D.Y. and Waller, M.A. (1996), Development and validation of TQM implementation constructs, *Decision Sciences*, Vol. 27 No. 1, pp. 23-56.
- Anderson, E. W., Fornell, C. and Lehmann, D.R. (1994), Customer satisfaction, market share, and profitability: Findings from Sweden, *Journal of Marketing*, Vol. 58, July, pp. 53-56.
- Anderson, J.C., Rungtusanatham, M., Schroeder, R. and Devaraj, S. (1995), A path analytic model of a theory of quality management underlying the Deming management method: Preliminary empirical findings, *Decision Sciences*, Vol. 26 No. 5, pp. 637-658.
- August, pp. 29-37.
- Benson, T. (1993), TQM: A child takes a first few faltering steps, *Industry Week*, Vol. 242 No. 7, pp. 16-17.
- Brown, M.G., Hitchcock, D.E. and Willard, M.L. (1994), *Why TQM Fails and What to Do About It*, Irwin, Burr Ridge, Illinois.
- Brown, M.G., Hitchcock, D.E. and Willard, M.L. (1994), *Why TQM Fails and What to Do About It*, Irwin, Burr Ridge, Illinois.
- Choi, T.Y. and Eboch, K. (1998), The TQM paradox: Relations among TQM practices, plant performance, and customer satisfaction, *Journal of Operations Management*, Vol. 17 No. 1, pp. 59-75.
- Crosby, P.B. (1979), *Quality Is Free*, McGraw-Hill, Inc., New York.
- Dean, J.W., Jr. and Bowen, D.E. (1994), Management theory and total quality: Improving research and practice through theory development, *Academy of Management Review*, Vol. 19 No. 3, pp. 392-418.
- Deming Prize (1996), *Guide for Overseas Companies*, Union of Japanese Scientists and Department of Defense (1988), *Institute of Defense Analysis, The role of concurrent engineering in weapons system acquisition*, IDA Report R-338.
- DuBrin, A.J. (1995), *Leadership: Research Findings, Practice, and Skills*, Houghton
- Easton, G.S. and Jarrell, S.L. (1998), The effects of total quality management on corporate performance: An empirical investigation, *Journal of Business*, Vol. 71 No. 2, pp. 253-307.

- Eskildson, L. (1994), Improving the odds of TQM's success, *Quality Progress*, Vol. 27 No. 4, pp. 61-63.
- European Foundation for Quality Management (1994), *Self-Assessment Based on the European Model for Total Quality Management: Guidelines for Identifying and Addressing Business Excellence Issues*, Brussels, Belgium.
- Feigenbaum, A.V. (1991), *Total Quality Control*, Third edition, McGraw-Hill, Inc., New York.
- Flynn, B.B., Schroeder, R.G. and Sakakibara, S. (1994), A framework for quality management research and an associated measurement instrument, *Journal of Operations Management*, Vol. 11, pp. 339-366.
- Garvin, D.A. (1986), Quality problems, policies and attitudes in the United States and Japan: An exploratory study, *Academy of Management Journal*, Vol. 29, pp. 653-673.
- Ghobadian, A. and Woo, H.S. (1996), Characteristics, benefits and shortcomings of four major quality awards, *International Journal of Quality & Reliability Management*, Vol. 13 No. 2, pp. 10-44.
- Gitlow, H., Gitlow, S., Oppenheim, A. and Oppenheim, R. (1989), *Tools and Methods for the Improvement of Quality*, IRWIN, Homewood, IL.
- Gitlow, H., Gitlow, S., Oppenheim, A. and Oppenheim, R. (1989), *Tools and Methods for the Improvement of Quality*, IRWIN, Homewood, IL.
- Hackman, J.R. and Wageman, R. (1995), Total quality management: Empirical, conceptual, and practical issues, *Administrative Science Quarterly*, Vol. 40, June, pp. 309-342.
- Handfield, R.B. (1993), A resource dependence view of just-in-time purchasing, *Journal of Operations Management*, Vol. 11, pp. 289-311.
- Hendricks, K.B. and Singhal, V.R. (1996), Quality awards and the market value of the firm: An empirical investigation, *Management Science*, Vol. 42 No. 3, pp. 415-436.
- Ho, S.K.M. and Fung, C.K.H. (1994), Developing a TQM excellence model, *TQM International Journal of Quality & Reliability Management*, Vol. 13 No. 1, pp. 72-83.
- Ishikawa, K. (1985), *What is Total Quality Control? The Japanese Way*, Prentice-Hall, London.
- ISO 10013 (1995), *Guidelines for Developing Quality Manuals*, First edition, International Organization for Standardization, Geneva, Switzerland.

- ISO 8402 (1994), *Quality Management and Quality Assurance - Vocabulary*, International Organization for Standardization, Geneva, Switzerland.
- Juran, J.M. (1994), The upcoming century of quality, *Quality Progress*, Vol. 27 No. 8,
- Kanji, G.K. and Asher, M. (1996), *100 Methods for Total Quality Management*, SAGE Publications, London.
- Longenecker, C.O. and Scazzero, J.A. (1993), Total quality management from theory to practice: A case study, *International Journal of Quality & Reliability Management*, Vol. 10 No. 5, pp. 24-31.
- Malcolm Baldrige National Quality Award (1999), *Criteria for Performance Excellence*, National Institute of Standards and Technology, United States Department of Commerce, Gaithersburg, MD.
- Mann, R.S. (1992), *The Development of a Framework to Assist in the Implementation of TQM*, PhD thesis, Department of Industrial Studies, University of Liverpool, UK. Mifflin Company, Boston.
- Motwani, J., Kumar, A. and Cheng, C.H. (1996), A roadmap to implementing ISO 9000,
- Patton, M.Q. (1990), *Qualitative Evaluation and Research Methods*, Second edition, Sage Publications, Newbury Park, London.
- Punch, K.F. (2000), *Developing Effective Research Proposals*, SAGE Publications, London.
- Randall, R.C. (1995), *Randall's Practical Guide to ISO 9000: Implementation, Registration, and Beyond*, Addison-Wesley Publish Company, Reading, MA.
- Rategan, C. (1992), Total quality management, *Journal of Property Management*, Vol. 57, pp. 32-34.
- Ross, J.E. (1993), *Total Quality Management*, St. Lucie Press, Delray Beach, FL.
- Rungtusanatham, M., Forza, C., Filippini, R. and Anderson, J.C. (1998), A replication study of a theory of quality management underlying the Deming management method: insights from an Italian context, *Journal of Operations Management*, Vol. 17 No. 1, pp. 77-95.
- Saraph, J.V., Benson, G.P. and Schroeder, R.G. (1989), An instrument for measuring the critical factors of quality management, *Decision Sciences*, Vol. 20, pp. 810-829.
- Schonberger, R. (1992), Total quality management cuts a broad swathe – through manufacturing and beyond, *Organizational Dynamics*, Vol. 21 No. 4, pp. 16-27.

- Steingard, D.S. and Fitzgibbons, D.E. (1993), A postmodern deconstruction of total quality management, *Journal of Organization Change Management*, Vol. 6 No. 5, pp.27- 42.
- Tornow, W.W. and Wiley, J.W. (1991), Service quality and management practices: A look at employee attitudes, customer satisfaction, and bottom-line consequences, *Human Resource Planning*, Vol. 14, pp. 105-115.
- Vuppalapati, K., Ahire, S.L. and Gupta, T. (1995), JIT and TQM: A case for joint implementation, *International Journal of Operations & Production Management*, Vol. 15 No. 5, pp. 84-94.
- Womack, J.P., Jones, D.T. and Roos, D. (1990), *The Machine That Changed the World*, Massachusetts Institute of Technology, Rawson Associates, New York.
- Zhang, Z.H. (2000a), Developing a model of quality management methods and evaluating their effects on business performance, *Total Quality Management*, Vol. 11 No. 1, pp. 129-137.
- Zhao, X.D., Young, S.T. and Zhang, J.C. (1995), A survey of quality issues among Nepalese executives and workers, *Production and Inventory Management Journal*, Vol. 36 No. 1, pp. 44-48.

APPENDIX- 1

Overall Business Performance Instrument

Scale 1: Employee Satisfaction

Please state the perceived overall employee satisfaction level in your firm (Choose as appropriate the employee satisfaction level in your firm).

Scale 2: Product Quality

Compared with the other firms within the same industry in Nepal, please state the situation of your primary products.

- (1) The performance of your primary products
- (2) The conformity rates of your primary products
- (3) The reliability of your primary products
- (4) The durability of your primary products
- (5) The defect rates of your primary products
- (6) The internal failure costs as a percentage of annual output value
- (7) The external failure costs as a percentage of annual sales

Scale 3: Customer Satisfaction

Please state the customer satisfaction level for your firm

- (1) The customer satisfaction level for product quality provided by your firm
- (2) The customer satisfaction level for service quality provided by your firm

Scale 4: Strategic Business Performance

1. What were the approximate annual sales achieved by your firm in the last financial year (Unit million RS)?

- (1) Less than 13 (2) 13.1 - 22 (3) 22.1 - 50
- (4) 50.1 - 150 (5) More than 150

2*. *Compared with the previous year, do you think your annual sales.*

- (1) *Decreased a great deal* (2) *Decreased slightly* (3) *Stayed almost the same*
- (4) *Increased slightly* (5) *increased a great deal*

3*. *Do you think your firm was?*

- (1) *Losing money badly* (2) *Losing money slightly* (3) *Breaking even*
- (4) *Making some profits* (5) *Very profitable*

4. Compared with the firm that had the biggest local market share (regarded as 100%) within the same industry in Nepal, what was the relative local market share of your products (your firm's output divided by the output of the biggest firm in the same industrial sector in Nepal)?

(1) 0% - 20.0% (2) 20.1% - 40% (3) 40.1% - 60% (4) 60.1% - 80% (5) 80.1% - 100%

5. Approximately what percentage of total annual sales by value was exported?

(1) 0% (2) 0.1% - 8% (3) 8.1% - 14% (4) 14.1% - 35% (5) More than 35%

Note: * means that these items in that scale formed one factor and the other items in that Scale formed another.

APPENDIX-2

Assessment Tools for TQM Implementation Practices and Overall Business Performance

1. Assessment Tool for TQM Implementation

This assessment tool can be used to assess TQM implementation in a firm. The first column lists the TQM implementation practices. The second column lists the addressed area(s) for each practice. These specifically addressed areas are presented in the form of positive statements. If some TQM implementation practices are not applicable (e.g., the firm does not have product design activities). It should be noted that scoring each TQM practice should be based on evidence rather than imagination.

1. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Leadership

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Top management commitment	<ul style="list-style-type: none"> - Pursue continuous improvement in all business activities; - Demonstrate constant commitment to the vision statement; - Demonstrate commitment to quality through actions rather than words; - Establish an organization-wide quality culture. 	<p>Strong</p> <p>Average</p> <p>Average</p> <p>Average</p>
Top management participation	<ul style="list-style-type: none"> - Lead TQM implementation standing from the front; - Participate in TQM implementation personally; - Communicate with and listen to employees; - Participate in assessing TQM implementation progress. 	<p>Strong</p> <p>Strong</p> <p>Average</p> <p>Strong</p>
Top management learning	<ul style="list-style-type: none"> - Accept education and training in management knowledge; - Give training lectures to employees; - Be modest enough to learn from employees. 	<p>Strong</p> <p>Average</p> <p>Average</p>
Top management empowerment	<ul style="list-style-type: none"> - Empower employees to solve quality problems; - Empower employees to make some urgent decisions; - Manage the firm in a humanistic manner. 	<p>Weak</p> <p>Weak</p> <p>Average</p>
Top management encouragement	<ul style="list-style-type: none"> - Encourage employee involvement in quality management activities; - Attach great importance to employees' suggestions; - Show more enthusiasm about TQM implementation; - Trust employees and believe that they can do things better; - Encourage employees to list the firm's shortcomings. 	<p>Strong</p> <p>Strong</p> <p>Strong</p> <p>Average</p> <p>Strong</p>
Top management's role model	<ul style="list-style-type: none"> - Act as role models leading by examples; - Handle matters impartially; - Observe the firm's various rules and regulations. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Pursuit of long-term business success	<ul style="list-style-type: none"> - Focus on quality of products and services rather than yields; - Pursue long-term overall business performance. 	<p>Average</p> <p>Weak</p>
Management by fact	<ul style="list-style-type: none"> - Make decisions based on facts rather than by imagination; - Use various pieces of information for decision-making. 	<p>Strong</p> <p>Strong</p>

2. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Supplier Quality Management

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Partnership with suppliers	<ul style="list-style-type: none"> - Work together with suppliers for mutual benefits; - Pursue long-term stable business relationships with suppliers; - Treat suppliers as partners rather than adversaries. 	<p>Weak</p> <p>Weak</p> <p>Weak</p>
Supplier selection criteria	<ul style="list-style-type: none"> - Obtain sufficient information about suppliers or potential suppliers; - Understand suppliers' facilities and production capabilities; - Select supplier based on the quality of products and services rather than price alone. 	<p>Strong</p> <p>Strong</p> <p>Weak</p>
Participation in suppliers	<ul style="list-style-type: none"> - Provide training for suppliers; - Participate in supplier quality improvement projects. 	<p>Average</p> <p>Average</p>
Supplier performance evaluation	<ul style="list-style-type: none"> - Evaluate the performance of products and services from suppliers; - Feed back the performance of products and services to suppliers; - Rate suppliers in terms of product quality and service quality; - Have supplier performance evaluation system for measuring suppliers' performance. 	<p>Strong</p> <p>Strong</p> <p>Strong</p> <p>Strong</p>
Supplier quality audit	<ul style="list-style-type: none"> - Conduct supplier quality audits regularly; - Audit suppliers' quality of products and services and quality management systems; - Audit suppliers' manufacturing facilities. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Supplier communication	<ul style="list-style-type: none"> - Inform suppliers of any change in design and/or production immediately; - Establish multiple channels of communication with suppliers. 	<p>Strong</p> <p>Strong</p>

3. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Vision and Plan Statement

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Vision statement	<ul style="list-style-type: none"> - Have a long-term vision statement; - Communicate the vision statement to employees; - Use the vision statement as a guide to formulate business strategies. 	Weak Weak Weak
Quality policy	<ul style="list-style-type: none"> - Have a written quality policy; - Communicate the quality policy to employees; - Use the quality policy as a guide to formulate quality goals. 	Strong Strong Strong
Overall business performance plan	<ul style="list-style-type: none"> - Have a long-term overall business performance plan; - Have an annual overall business performance plan; - Set up a realistic overall business performance plan scientifically. 	Weak Average Average
Product quality goal	<ul style="list-style-type: none"> - Have the goal of product performance, reliability, and durability; - Have the goal of conformity rate and internal defect rate; - Have the goal of internal losses; - Have the goal of external losses; - Establish realistic quality goal indices scientifically. 	Average Strong Strong Strong Average
Quality improvement plan	<ul style="list-style-type: none"> - Formulate a quality improvement plan to target major problem areas; - Implement the quality improvement plan in practice. 	Strong Weak
Formulation of vision and plan	<ul style="list-style-type: none"> - Formulate the vision and plans in a holistic and cross-functional approach; - Use sufficient information to formulate the vision and plans; - Formulate the vision and plans by employees from different levels; - Make the vision, plans, and practices in a consistent manner. 	Average Average Average Average

4. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Evaluation

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Evaluation of strategy	<ul style="list-style-type: none"> - Evaluate strategies at different levels; - Adjust strategies on the basis of the evaluation. 	Strong Strong
Evaluation of overall business performance	<ul style="list-style-type: none"> - Have data on employee satisfaction and evaluate employee satisfaction; - Have data on product quality and evaluate product quality; - Have data on customer satisfaction and evaluate customer satisfaction; - Have data on strategic business performance and evaluate strategic business performance; - Formulate improvement actions on the basis of evaluations. 	Weak Strong Strong Strong Average
Evaluation of departments' performance	<ul style="list-style-type: none"> - Have performance criteria for different departments; - Evaluate departments' performance regularly; - Use evaluation results for improvement, recognition, and reward. 	Strong Strong Strong
Evaluation of employee performance	<ul style="list-style-type: none"> - Have performance criteria for different employees; - Evaluate employee performance against set targets; - Use evaluation results for employees' education and training, recognition and reward. 	Strong Strong Strong
Quality audit	<ul style="list-style-type: none"> - Conduct quality audits regularly; - Identify problem areas and formulate action plans. 	Strong Strong
Benchmarking	<ul style="list-style-type: none"> - Have relevant information from competitors and best-in-class organizations; - Benchmark the competitors; - Benchmark the best-in-class firms; - Formulate improvement actions on the basis of benchmarking. 	Average Weak Average Average
Quality costs	<ul style="list-style-type: none"> - Have data on internal failure costs; - Have data on external failure costs; - Have data on appraisal costs; - Have data on prevention costs; - Use such information to formulate improvement actions. 	Strong Strong Weak Weak Average
Information system	<ul style="list-style-type: none"> - Have a computer-based integrated information system; - Have sufficient information in the system; - Share information among different departments; - Use the information system extensively for various business activities. 	Weak Average Average Average

5. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Process Control and Improvement

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Shop floor control	<ul style="list-style-type: none"> - Keep the shop floor neat and clean at all times; - Assign employees the responsibility of cleaning their own working areas; - Determine an appropriate temperature range and lighting intensity; - Reduce noise level and improve air quality. 	<p>Strong Strong</p> <p>Weak</p> <p>Weak</p>
Process capability	<ul style="list-style-type: none"> - Calculate a process capability index; - Control and improve process capability; - Use the process capability index for setting realistic specification limits. 	<p>Weak</p> <p>Weak</p> <p>Weak</p>
Equipment maintenance and innovation	<ul style="list-style-type: none"> - Have equipment maintenance and innovation plan; - Conduct breakdown equipment maintenance; - Conduct preventive equipment maintenance; - Assign employees the responsibility for daily equipment maintenance; - Innovate production equipment to meet production requirements. 	<p>Strong</p> <p>Strong</p> <p>Weak</p> <p>Strong</p> <p>Weak</p>
Inventory management	<ul style="list-style-type: none"> - Keep the amounts of inventories as low as possible; - Keep the warehouse neat and keep inventories in good order. 	<p>Strong</p> <p>Strong</p>
Inspection	<ul style="list-style-type: none"> - Conduct effective incoming, in-process, and final inspection; - Assign employees responsibilities to perform self-inspection; - Conduct sampling inspection; - Use inspection information to seek quality improvement; - Try to reduce various inspection activities. 	<p>Strong</p> <p>Strong</p> <p>Strong</p> <p>Average</p> <p>Weak</p>
Use of quality tools	<ul style="list-style-type: none"> - Use the PDCA cycle extensively, for different activities; - Use the seven QC tools extensively; - Use the seven new QC tools extensively; - Use statistical process control extensively. 	<p>Average</p> <p>Weak</p> <p>Weak</p> <p>Weak</p>

6. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Product Design

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Concurrent engineering	- Establish cooperative relationships during the whole product design process;	Weak
	- Design products through cooperation among people from various functional departments, suppliers, or customers.	Weak
Reliability engineering	- Set overall reliability goals;	Average
	- Identify critical parts and causes of failures;	Average
	- Determine solutions for increasing failure resistance.	Average
Designing for manufacturability	- Simplify a design by reducing total number of parts;	Strong
	- Make parts more producible;	Average
	- Focus on modular designs.	Weak
Design of experiments	- Use experimental design extensively for new product development.	Weak
Quality function deployment	- Have sufficient information on customer needs and expectations;	Average
	- Prioritize customer needs and expectations for product design;	Average
	- Transfer customer needs and expectations into product specifications.	Strong
Value engineering	- Analyze the contribution of different parts to product quality;	Strong
	- Reduce product costs without decreasing product quality.	Strong
Computer-aided design	- Design a new product with the help of a computer.	Strong

7. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Quality System Improvement

TQM Implementation Practices	Addressed Areas	Strengths & Weakness
Quality Manual	<ul style="list-style-type: none"> - Have a quality manual; - Formulate the quality manuals by people from different departments; - Get the quality manual approved by the general manager. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Quality system procedures	<ul style="list-style-type: none"> - Define responsibilities and authorities of different functional departments; - Solve the interface issues among different departments; - Draw up quality system procedure by people from different departments. 	<p>Strong</p> <p>Strong</p> <p>Weak</p>
Work instructions	<ul style="list-style-type: none"> - Integrate existing work documents into works instructions; - Draw up various work instruction referring to procedures; - Formulate work instructions by people from different departments. 	<p>Strong</p> <p>Strong</p> <p>Weak</p>
ISO 9001 certification	<ul style="list-style-type: none"> - Implement all quality system documents in practice; - Modify quality system documents through quality audits and management review; - Select a registration body for ISO 9001 certification; - Improve quality system documents continuously 	<p>Weak</p> <p>Strong</p> <p>Strong</p> <p>Strong</p>

8. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Employee Participation

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Cross-functional team	<ul style="list-style-type: none"> - Have some cross-functional teams; - Choose team members according to their potential contributions; - Use cross-functional teams to effectively solve cross-functional problems. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Quality control (QC) circle	<ul style="list-style-type: none"> - Have some QC circles; - Encourage employees to participate in QC circles; - Evaluate the effects of QC circles. 	<p>Weak</p> <p>Weak</p> <p>Weak</p>
Within-functional team	<ul style="list-style-type: none"> - Have some within-functional teams; - Choose team members according to their potential contributions; - Evaluate the effects of within-functional teams. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Information communication	<ul style="list-style-type: none"> - Provide sufficient information to employees by means of regular meetings, posters, newsletters, videos, and broadcasting; - Have effective information communication among different departments; - Stimulate mutual communication among people at different levels. 	<p>Strong</p> <p>Strong</p> <p>Average</p>
Employee suggestions	<ul style="list-style-type: none"> - Have effective employee suggestion systems; - Encourage employees to submit suggestions; - Evaluate employee suggestions promptly, - Feed back evaluation results to suggestion providers; - Implement some employee suggestions after evaluation; - Provide recognition and reward for employee suggestions. 	<p>Strong</p> <p>Strong</p> <p>Strong</p> <p>Average</p> <p>Average</p> <p>Strong</p>
Improving employee commitment	<ul style="list-style-type: none"> - Care for employees in job- and career-related development; - Respect and trust employees; - Encourage employees to report their own working problems. 	<p>Average</p> <p>Average</p> <p>Weak</p>
Job rotation	<ul style="list-style-type: none"> - Rotate employee jobs regularly; - Establish internal partnerships between employees. 	<p>Weak</p> <p>Average</p>
Workers' congress	<ul style="list-style-type: none"> - Hold workers' congress meetings regularly, - Discuss important issues through the workers' congress; - Approve important decisions by the workers' congress; - Supervise the behavior and conducts of management personnel. 	<p>Strong</p> <p>Strong</p> <p>Strong</p> <p>Average</p>
Trade union	<ul style="list-style-type: none"> - Improve labor-management relations; - Ensure the democratic rights of employees; - Care for employees' quality of working life, - Perform duties strictly according to the Trade Union Law. 	<p>Strong</p> <p>Strong</p> <p>Strong</p> <p>Average</p>

9. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Recognition and Reward

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Recognition and reward program	<ul style="list-style-type: none"> - Have recognition and reward plan; - Have objective and measurable criteria for recognition and reward; - Get recognition and reward program approved by the workers' congress. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Working environment improvement	<ul style="list-style-type: none"> - Improve working environment for recognizing employees' quality improvement efforts; - Pay sufficient attention to employee well-being, safety, morale, and growth; - Reduce employees' working strengths by providing suitable equipment, devices, or tools. 	<p>Average</p> <p>Average</p> <p>Average</p>
Salary promotion	<ul style="list-style-type: none"> - Increase employees' salaries on the basis of employees' performance; - Increase employees' salaries fairly and rationally; - Widen salary differences between employees with different skill levels and different contributions. 	<p>Strong</p> <p>Strong</p> <p>Weak</p>
Bonus scheme	<ul style="list-style-type: none"> - Set up targets for different employees (teams, departments, or business units); - Align targets with the overall organizational objectives; - Provide more bonuses to well performing employees (teams, departments, or business units). 	<p>Strong</p> <p>Strong</p> <p>Weak</p>
Position promotion	<ul style="list-style-type: none"> - Promote employees based on their capabilities, skills, performance, and contributions to the firm; - Appoint and remove managerial personnel (e.g., middle management and supervisors) according to the principle of equal competition, fairness, and rationality. 	<p>Strong</p> <p>Strong</p>
Moral award	<ul style="list-style-type: none"> - Provide moral awards to well-performing employees by means of a thank-you note, oral praise, a letter of praise, award certification, or award ceremony; - Reward employees fairly and rationally. 	<p>Strong</p> <p>Strong</p>
Penalty	<ul style="list-style-type: none"> - Have an effective penalty criterion; - Penalize employees according to the criterion; - Implement penalty scheme strictly. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>

10. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Education and Training

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Education and training plan	<ul style="list-style-type: none"> - Have an effective education and training plan; - Formulate the education and training plan on the basis of employees' requirements and the firm's resources; - Provide sufficient resources for implementing the education and training plan. 	<p>Strong</p> <p>Average</p> <p>Weak</p>
Team learning	<ul style="list-style-type: none"> - Arrange for skillful employees to present their working experiences; - Encourage team members to present their ideas during the process of team activities; - Share knowledge among team members. 	<p>Weak</p> <p>Weak</p> <p>Weak</p>
Quality awareness education	<ul style="list-style-type: none"> - Provide quality awareness education to employees regularly; - Provide extensive quality awareness education to newly recruited employees. 	<p>Weak</p> <p>Weak</p>
Training for quality management knowledge	<ul style="list-style-type: none"> - Train employees on understanding the philosophy of TQM; - Train employees on understanding ISO 9000; - Train employees on using the seven QC tools, the seven new QC tools, and statistical process control; - Train designers on using design tools such as experimental design. 	<p>Strong</p> <p>Strong</p> <p>Weak</p> <p>Weak</p>
Job training	<ul style="list-style-type: none"> - Provide job training for employees to perform their jobs better; - Provide different training to different employees according to their actual job requirements. 	<p>Weak</p> <p>Average</p>
Formal education promotion	<ul style="list-style-type: none"> - Encourage employees to follow formal promotion education programs; - Arrange new positions for employees who have finished their promotion education programs. 	<p>Strong</p> <p>Strong</p>

11. Please Write the Strengths and weakness as strong, average or weak in the following addressed areas. Strong – refers to the strictly followed of TQM requirements, Average – refers to partially followed of TQM requirement, Weak – refers to no followed of TQM requirement.

Customer Focus

TQM Implementation Practices	Addressed Areas	Strengths and Weaknesses
Customer complaint information	<ul style="list-style-type: none"> - Establish customer complaint registration system; - Collect customer complaint information extensively; - Treat customer complaints with top priorities; - Analyze customer complaint information to formulate further improvement actions. 	<p>Strong Strong</p> <p>Strong Strong</p>
Market investigation	<ul style="list-style-type: none"> - Collect information about customers' needs and expectations through market investigation; - Obtain information about customers' potential needs and expectations; - Formulate effective actions for improving quality of products and services through market investigation. 	<p>Weak</p> <p>Weak</p> <p>Weak</p>
Customer satisfaction survey	<ul style="list-style-type: none"> - Have effective customer satisfaction measurements; - Have customer satisfaction levels on the quality of products and services; - Have customer satisfaction information on the quality of products and services from your competitors; - Use the information from customer satisfaction surveys for quality improvements. 	<p>Average</p> <p>Strong</p> <p>Weak</p> <p>Strong</p>
Quality warranty	<ul style="list-style-type: none"> - Provide a quality warranty on products sold to customers. 	<p>Strong</p>
Customer services	<ul style="list-style-type: none"> - Provide necessary assistance for customers before purchasing, during the process of purchasing, and after purchasing; - Have service standards and implement their standards strictly; - Have skillful sales and service personnel. 	<p>Strong</p> <p>Strong</p> <p>Strong</p>
Customer information system	<ul style="list-style-type: none"> - Have an effective customer information system; - Store various data related to customers (e.g., satisfaction surveys, their needs and expectations). 	<p>Average</p> <p>Average</p>

APPENDIX-3

Calculation of Mean and Median

1. Leadership

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Top management commitemen	$\frac{3 + 2 + 2 + 2}{4}$	2.25	2
2	Top management participation	$\frac{3 + 3 + 2 + 3}{4}$	2.75	3
3	Top management Learning	$\frac{3 + 2 + 2}{3}$	2.33	2
4	Top management empowerment	$\frac{1 + 1 + 2}{3}$	1.3	1
5	Top management encouragement	$\frac{3 + 3 + 3 + 2 + 3}{5}$	2.8	3
6	Top management role model	$\frac{3 + 3 + 3}{3}$	3	3
7	Pursuit of long-term business success	$\frac{2 + 1}{2}$	1.5	2
8	Management by fact	$\frac{3 + 3}{2}$	3	3

2. Supplier Quality Management

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Partnership with supplier	$\frac{1 + 1 + 1}{3}$	1	1
2	Supplier selection criteria	$\frac{3 + 3 + 1}{3}$	2.3	2
3	Participation in suppliers	$\frac{2 + 2}{2}$	2	2
4	Suppliers performance evaluation	$\frac{3 + 3 + 3 + 3}{4}$	3	3
5	Suppliers quality audit	$\frac{3 + 3 + 3}{3}$	3	3
6	Suppliers communication	$\frac{3 + 3}{2}$	3	3

3. Vision and Plan Statement

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Vision statement	$\frac{1 + 1 + 1}{3}$	1	1
2	Quality policy	$\frac{3 + 3 + 3}{3}$	3	3
3	Overall business performance plan	$\frac{1 + 2 + 2}{3}$	1.7	2
4	Product quality goal	$\frac{2 + 3 + 3 + 3 + 2}{5}$	2.6	3
5	Quality improvement plan	$\frac{3 + 1}{2}$	2	2
6	Formulation of vision and plan	$\frac{2 + 2 + 2 + 2}{4}$	2	2

4. Evaluation

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Evaluation of strategy	$\frac{3 + 3}{2}$	3	3
2	Evaluation of overall business performance	$\frac{1 + 3 + 3 + 3 + 2}{5}$	2.4	2
3	Evaluation of departments' performance	$\frac{3 + 3 + 3}{3}$	3	3
4	Evaluation of employee performance	$\frac{3 + 3 + 3}{3}$	3	3
5	Quality audit	$\frac{3 + 3}{2}$	3	3
6	Benchmarking	$\frac{2 + 1 + 2 + 2}{4}$	1.75	2
7	Quality costs	$\frac{3 + 3 + 1 + 1 + 2}{5}$	2	2
8	Information system	$\frac{1 + 2 + 2 + 2}{4}$	1.75	2

5. Process Control and Improvement

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Shop floor control	$\frac{3+3+1+1}{4}$	2	2
2	Process capability	$\frac{1+1+1}{3}$	1	1
3	Equipment maintenance and innovation	$\frac{3+3+1+3+1}{5}$	2.2	2
4	Inventory management	$\frac{3+3}{2}$	3	3
5	Inspection	$\frac{3+3+3+2+1}{5}$	2.4	2
6	Use of quality tools	$\frac{2+1+1+1}{4}$	1.25	1

6. Product Design

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Concurrent engineering	$\frac{1+1}{2}$	1	1
2	Reliability engineering	$\frac{2+2+2}{3}$	2	2
3	Designing for manufacturability	$\frac{3+2+1}{3}$	2	2
4	Design of experiments	$\frac{1}{1}$	1	1
5	Quality function deployment	$\frac{2+2+3}{3}$	2.3	2
6	Value engineering	$\frac{3+3}{2}$	3	3
7	Computer-aided design	$\frac{3}{1}$	3	3

7. Quality System Improvement

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Quality manual	$\frac{3+3+3}{3}$	3	3
2	Quality system procedures	$\frac{3+3+1}{3}$	2.33	2
3	Work instructions	$\frac{3+3+1}{3}$	2.33	2
4	ISO 900 certification	$\frac{1+3+3+3}{4}$	2.5	3

8. Employee Participation

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Cross-functional team	$\frac{3+3+3}{3}$	3	3
2	Quality control (QC) circle	$\frac{1+1+1}{3}$	1	1
3	Within- functional team	$\frac{3+3+3}{3}$	3	3
4	Information communication	$\frac{3+3+2}{3}$	2.66	3
5	Employee suggestions	$\frac{3+3+3+2+2+3}{6}$	2.66	3
6	Improving employee commitment	$\frac{2+2+1}{3}$	1.66	2
7	Job rotation	$\frac{1+2}{2}$	1.5	2
8	Workers' congress	$\frac{3+3+3+2}{4}$	2.75	3
9	Trade union	$\frac{3+3+3+2}{4}$	2.75	3

9. Recognition and Reward

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Recognition and reward program	$\frac{3+3+3}{3}$	3	3
2	Working environment improvement	$\frac{2+2+2}{3}$	2	2
3	Salary promotion	$\frac{3+3+1}{3}$	2.33	2
4	Bonus scheme	$\frac{3+3+1}{3}$	2.33	2
5	Position promotion	$\frac{3+3}{2}$	3	3
6	Moral award	$\frac{3+3}{2}$	3	3
7	Penalty	$\frac{3+3+3}{3}$	3	3

10. Education and Training

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Education and training plan	$\frac{3+2+1}{3}$	2	2
2	Team learning	$\frac{1+1+1}{3}$	1	1
3	Quality awareness education	$\frac{1+1}{2}$	1	1
4	Training for quality management knowledge	$\frac{3+3+1+1}{4}$	2	2
5	Job training	$\frac{1+2}{2}$	1.5	2
6	Formal education promotion	$\frac{3+3}{2}$	3	3

11. Customer Focus

S.N.	Implementation Practice	Calculation of Mean	Mean	Median
1	Customer complaint information	$\frac{3+3+3+3}{4}$	3	3
2	Market investigation	$\frac{1+1+1}{3}$	1	1
3	Customer satisfaction survey	$\frac{2+3+1+3}{4}$	2.25	2
4	Quality warranty	$\frac{3}{1}$	3	3
5	Customer services	$\frac{3+3+3}{3}$	3	3
6	Customer information system	$\frac{2+2}{2}$	2	2