

**QUALITY CULTURE AND QUALITY COSTS OF A  
MANUFACTURING ORGANIZATION IN PENANG, MALAYSIA**

**by**

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## ABSTRAK

Penyelidikan ini telah dijalankan untuk mengaji samada wujudnya perbezaan di antara budaya kualiti pada peringkat pengurusan, penyelia dan operator di suatu organisasi. Perhubungan di antara budaya kualiti pada peringkat pengurusan dan berbagai kos kualiti dikaji. Kajian yang sama juga dijalankan untuk membandingkan budaya kualiti dua organisasi pada peringkat operator dua orgainsasi tersebut di atas.

Keputusan yang diperolehi menunjukkan bahawa tiada perbezaan dalam budaya, kualiti di antara peringkat pengurusan, penyelia dan operator di GLT. Tetapi, wujudnya perbezaan budaya kualiti pada peringkat operator di antara tiga organisasi.

## ABSTRACT

The research was conducted to study whether there is any significant difference between the quality culture at the management, supervisor and operator levels of an organization. The relationship between quality culture at management level and various elements of quality costs of the organization was examined. A Similar study was carried out to compare the quality culture at operator level of two other different organizations with the above organization.

The results indicated that there was no significant difference between the quality at the management, supervisor and operator levels. However, there were significant differences between the quality culture of operator levels for the three organizations.

## Chapter 1

### INTRODUCTION

#### 1.1 INTRODUCTION

An organization gains advantage by outperforming competitors through one or more of the strategic weapons : quality, reliability, delivery, product and volume flexibility and price. For the current decade and also to achieve Malaysia's Vision 2020, quality is the most important of these weapons. Internally, the benefits derived from the focus of quality are enormous in terms of reduced costs, improved productivity and delivery performance, and the elimination of waste. Externally, the attainment and maintenance of satisfactory levels of customer satisfaction with the quality (from the customer's point of view) of products or services are today fundamental determinants for business health, growth and economic sustainability.

Quality has to be planned and managed for its everlasting success. Everyone from an operator to the chief executive in the organization plays an important role towards contributing to quality products and/or

services. Understanding and continuous commitment by the top management are essential to shape and promote quality culture in the organization.

Total Quality Management (TQM) is an important topic in business and academic circles today. TQM concept has been adopted by many industries to promote quality within an organization where most or all key management processes are integrated towards quality goals. The major approaches to TQM emphasize customer focus as key to improved quality. The concept of applying the customer label to relationship internal to the organization is credited to Professor Ishikawa (Dobyns & Crawford- Mason, 1991). Throughout all organizations there are a series of internal suppliers and customers, whereby suppliers concentrate on meeting or exceeding the expectations of the customers. In the TQM model proposed by Oakland (1993), as shown in Figure 1.1, culture is one of the major elements besides commitment and communication.

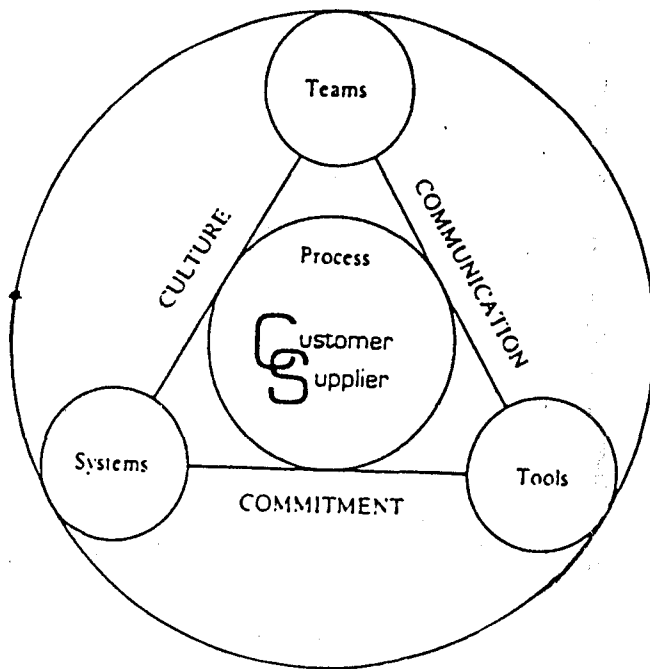


Figure 1.1 Total quality management model

[Source : Total Quality Management by Oakland JS, 1993]

The quality culture of the organization reflects the extent of management commitment towards quality improvement. British Standard BS 6143 (1991) illustrates the relation between quality related costs and quality awareness and improvement (Refer to Figure 1.2). The extent of quality awareness and improvement in the organization is a function of management commitment towards quality improvement. The management commitment can be partly assessed from the costs of quality incurred and/or invested. Thus an organization with quality

culture will invest in prevention and appraisal costs in order to bring down the failure costs, which in turn reduces overall quality costs.

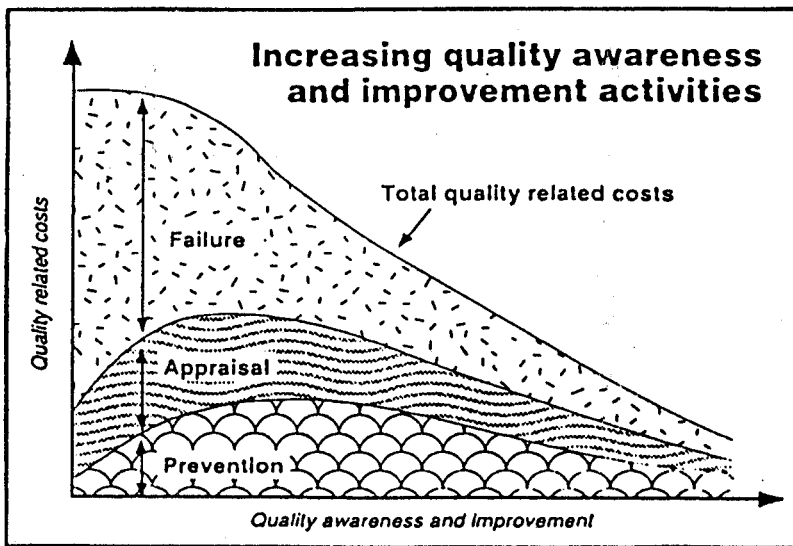


Figure 1.2 Quality related costs versus quality awareness and improvement.

[Source : British Standard BS 6143, 1993]

## 1.2 PURPOSE OF THE STUDY

A thorough understanding of an organization's existing culture is important for devising a strategy for change. This study will be carried out to examine whether there is any significant difference in the extent of quality culture at the management, supervisor and

operator levels of a semiconductor factory in Penang, Malaysia. Further, the study will also look into the various components of quality costs to assess management commitment towards quality improvement.

Similar study will be carried out to compare the quality culture of different organizations with the above semiconductor organization.

### 1.3 SIGNIFICANCE OF THE STUDY

This study attempts to assess the existing quality culture of the organization and the management actions, which reflects the management commitment towards quality improvement in the organization. The findings from this study :

(i) could provide the management the essential information about the extent of quality culture and the quality costs in the organization;

(ii) could be used to identify the cultural changes needed in the organization to continually improve quality and competitiveness, and thus contribute towards Malaysia's Wawasan 2020.

## 1.4 DEFINITIONS OF TERMS

### 1.4.1 Quality Culture

Every organization has a culture. Whether weak or strong, culture has a powerful influence throughout an organization; it affects practically everything - from whom to recruit and what decisions are made, to how resources can be effectively and efficiently managed. Because of this, culture has a major role to play towards the success of an organization.

Culture, as Webster's New Collegiate Dictionary defines it, is " the integrated pattern of human behavior that includes thought, speech, action, and artifacts and depends on man's capacity for learning and transmitting knowledge to succeeding generations ". According to Goetsch & Davis (1994), an organization's culture is the everyday manifestation of its underlying values and traditions. It shows up in how employees behave on the job, their expectations of the organization and each other, and what is considered normal in terms of how employees approach their jobs. Bower (1966) offered a more informal and simple definition of the organization culture as " the way we do things around here ".



Quality is often used to signify "excellence" of a product or service. Juran (1988) defines quality as "fitness for purpose or use ". According to Feigenbaum (1991) quality is " the total composite product and service characteristics of marketing, engineering, manufacture and maintenance through which the product and service in use will meet the expectations of the customer". Crosby (1979) looked at quality as "conformance to requirements". Oakland (1993) summarizes the definitions of quality from different quality gurus and puts it simply as "meeting the customer needs and requirements". For the purpose of this study, quality is considered as "meeting the customer needs and requirements".

A quality culture is an organizational value system that results in an environment that is conducive to the establishment and continual improvement of quality; it consists of values, traditions, procedures, and expectations that promote quality in the organization (Goetsch & Davis, 1994).

#### 1.4.2 Quality Costs

Quality costs are the total costs caused by defects and the costs for preventing and correcting defects (Madhav & Walter, 1990). Dale and Plunkett (1990) define quality costs more comprehensively as "the costs incurred in designing, implementing, operating and maintaining quality management systems, plus the costs incurred owing to failures of systems or products. There is always a misconception that improving quality means increasing cost of production or service. Rather, with the appropriate investment in the quality costs it will end up with reduced costs of production or service.

#### 1.5 DESIGN OF INVESTIGATION

The study shall be carried out by analyzing data collected through structured questionnaires and the past two years' financial data on the quality costs. The unit of analysis is the group of managers, supervisors and operators. Hypothesis testing shall be used for the data analysis in this study.

## Chapter 2

### REVIEW OF THE LITERATURE

#### 2.1 HISTORY OF RESEARCH

There are hardly any formal studies carried out to assess the quality culture of organizations. According to Juran & Gryna (1993), formal approaches to assessing the quality culture are still evolving. Hulse (1983) used the discussion group approach to assess the quality culture of health care products industry. A "round table" of 15 individuals was formed to discuss the state of quality affairs in the company. It included an inspection supervisor, several engineering managers, a plant manager, a production manager, a vice president of manufacturing, a director of marketing, a director of quality assurance, and several other members involved in quality assurance activity. The meeting was held for three days at a rural retreat. A series of topical graphs were used. The graphs were designed to evoke personal opinion and observations about the perceptions of the attendees. At the final stages of the conference, three independent working groups were formed to achieve a commonality of opinions and perceptions. The groups were given a statement concerning shortcomings in the company

in the form of practices that lead to falling behind the competition in quality. Group discussion were directed to confirm or deny the accuracy of the statement. This approach generated a positive and critical analysis of quality affairs. However, it requires expertise to prepare for and facilitate the meeting and also the commitment of the company involved to get the participation of its employees.

Another approach for assessing the quality culture is the use of written questionnaires. Ryan & Wong (1984) used 14 questions to assess the quality culture of a manufacturing company.

According to Bounds (1994), there are two opposing notions of how to view culture : the outward view and the inward view. The outward view of culture focusses on behavior and those things about culture that are directly observable, such as artifacts, patterns of behavior, speech, formal laws and technical know-how. The inward view of culture stresses the process through which behavior is learned, and the ideas, beliefs, symbolism, and evaluative aspects of culture. Organizations develop

their culture as they learn how to cope with internal and external problems of survival and prosperity.

Schein (1985) subdivides culture into three levels : artifacts (Level 1) , values and beliefs (Level 2) and underlying assumptions reside in the minds of people (Level 3).

According to Deal and Kennedy (1982), to have a strong culture, top management first has to recognize what kind of culture the organization already has. The ultimate success of an organization depends a large degree on accurate reading of the corporate culture and the ability to shape it to fit the shifting needs of the marketplace. If quality is the guiding value of the organization, then quality culture needs to be shaped in the organization.

From the research by Goetsch & Davis (1994), organizations with a quality culture, regardless of the products or services they provided, share the following common characteristics (they are the variables in this study) :-

- \* Open, continual communication.
- \* Obsession with continual improvement.
- \* Broadbased employee empowerment.
- \* Sincere desire for customer input and feedback.
- \* Fellow employees are viewed as internal customers.
- \* Teamwork approach to problems solving and process improvement.
- \* Recognition and rewards for contribution to quality.
- \* Possession of knowledge and skills needed to continuously improve quality.

Feigenbaum (1991), who first presented the concept of quality cost, categorizes quality costs into two principal areas : the costs of control and the costs of failure of control.

The costs of control are measured in two segments :

i) Prevention costs

Costs which keep defects and nonconformities from occurring and include the quality expenditures to keep unsatisfactory products from being produced in the first place.

The costs include design development, supplier review, operator quality education, process study, equipment and machine improvement, and quality management and planning .

ii) Appraisal costs

These are the costs for maintaining organization quality levels by means of formal evaluations of product quality.

The costs include purchasing appraisal costs, inspections and tests, calibration and maintenance, and outside endorsement and certification.

The costs of the failure of control, which are caused by materials and products that do not meet the quality requirements, are also measured in two segments

--

i) Internal failure costs

These are the costs of unsatisfactory quality within the organization.

The costs include scrap, rework, downgraded end products, idle time, corrective action and failure analysis.

ii) External failure costs

These are the costs of unsatisfactory quality outside the organization.

The costs include warranty expenses, customer service, loss of good will, returned goods investigation and repairs, and liability costs.

The previous researches were carried out to assess the quality culture of organizations to address specific problems that needed solutions. They were basically the applied research.

## 2.2 REVIEW OF KEY STUDIES

Unlike basic research, the researches carried out to assess quality culture in organizations were concerned with the study and identification of problem areas in order to find solutions that can be implemented to rectify the problem situation. The findings of these researches could not be generalized to develop any theory. Each organization had its own strengths and weaknesses that need to be addressed.



According to Juran & Gryna (1980), the ratios of category of costs to total quality costs vary widely among industries and even among companies in the same industry. Many companies exhibit ratios which fall within the following ranges (refer to Table 2.1) :

Table 2.1 Quality costs as percentage of total quality costs

Quality cost category	Percent of total quality costs
Internal failures	25 - 40
External failures	20 - 40
Appraisal	10 - 50
Prevention	0.5 - 5

From the survey carried out by Dale and Plunkett (1990), quality related costs commonly range from 5% to 25% of organization's turnover, depending on the industry where the organizations are operating in. Of this total, 95% is expended on appraisal and failure costs; which means, prevention costs only represent 5% out of the total quality costs.

Feigenbaum (1991) finds that many organizations have been spending their quality-cost dollars the wrong way: a

fortune down the drain because of product failures; another large sum to support a sort-the-bad-from-the-good appraisal screen to try to keep too many bad products from going on to the customers; comparatively nothing for the true defect-prevention technology that can do something about reversing the vicious upward cycle of higher quality costs and less reliable product quality.

Feigenbaum (1991) strongly suggested an increased expenditure for prevention to bring about reduced failure costs and reduced appraisal costs, with the balance of the quality-cost dollars going to profit. The 5% out of every dollar that is now being spent for prevention of poor quality may well need to be doubled or tripled, with much of the increase going towards improved efforts in the systems engineering activities, including value engineering and value analysis, of quality control. The end result is substantial reduction in the cost of quality and an increase in the level of quality and finally the customer satisfaction.

British Standard BS 6143 (1991) illustrates the relation between the cost of prevention/appraisal and failure costs (external and internal). As more investment

is made into prevention and appraisal, the internal and external failure costs will decrease. (Refer to Figure 1.2).

### 2.3 EVALUATION OF KEY STUDIES

As formal approaches to assessing quality culture are still evolving, the findings of the studies of quality culture are not readily available for references. Based on the characteristics of quality culture put forward by Goetsch & Davis (1994) and presented in section 2.1, questionnaire was developed to measure each of the characteristics.

The findings from researches on costs of quality shall be used for comparison purposes in this study.

## Chapter 3

### RESEARCH METHODS

#### 3.1 INTRODUCTION

This chapter describes the methodology of the research design in this study. This chapter will guide the researcher in the collection and gathering of relevant data to achieve the research objectives.

#### 3.2 SUBJECTS

For the study on the quality culture at the organization level (organization GLT), the population comprises of all the employees in the organization. The population is then subdivided into different levels, i.e. management, supervisor and operator levels.

Management provides direction for the alignment of all the employees in the organization to achieve its mission. Supervisors serve as the bridge linking the management and operators. Operators, being the lowest level in the organization hierarchy, execute the instructions of the management through supervisors to convert input into output.

By stratifying the employees in the organization into different job levels will help the researcher to identify the levels which need most attention with regards to quality so that the organization can focus on taking actions at the right level. The extent, quality and intensity of training desired by management, supervisor and operator levels will be different in each group. Knowing the kinds of differences that exist among them will help in the development of useful and meaningful training programs to implement Total Quality Management at different levels in the organization.

Samples are also taken from different organizations to compare the extent of their quality culture at the operator levels with the above organization. The comparison of quality culture is made at the operator levels only due to the constraints of time.

### 3.3 RESEARCH PROBLEMS

This study attempts to investigate the extent of quality culture at the management, supervisor and operator levels in a semiconductor factory (organization GLT) in Penang and also among operators in different organizations. The hypotheses developed are as follows :

Null hypothesis 1 : There is no significant difference in the extent of quality culture among the management, supervisor, and operator levels.

Null hypothesis 2 : There is no significant difference in the extent of quality culture among the operators in the three organizations studied.

Financial data of organization GLT for the past two years are gathered to analyze the quality costs of the factory to match the extent of quality culture at the management level with the quality costs. A management of quality culture should invest a relatively higher proportion of quality costs in the prevention in order to bring down the failure costs. As the saying goes, 'Prevention is better than cure'. Investment in prevention costs ensure that things are done right the first time; there is no waste in doing it all over again.

Data are also gathered from different organizations in the high technology electronics industry to study whether there is any significance difference in the quality culture among the operator levels.

### 3.4 QUESTIONNAIRE

#### 3.4.1 Background Of The Questionnaire

As mentioned earlier in Section 2.1, the formal approaches to assessing the quality culture are still evolving, questionnaire for the assessment is not readily available. The questionnaire in this study is self developed after conducting an extensive search of the literature for all possible items to be included in the measurement of quality culture and the scale to be used. Expert opinions of two experienced Quality Assurance Managers and a Professor were solicited. They were asked for any suggestions as to any additions or deletions to the variables and the scale. The questionnaire was reviewed thrice before being translated into Bahasa Malaysia version. The translated version was double checked by two secondary school Bahasa Malaysia teachers to see if it conveys the same meaning as the original English version.

Both the English and Bahasa Malaysia version were presented to three supervisors and five operators in the organization GLT. They were encouraged to give suggestions and criticisms as to the contents and/or wording of the scale. Eight items were simplified or reworded as a result from the feedback from the supervisors and operators.

#### 3.4.2 Question Categories

The questionnaire (Appendix 1) consists of nine parts - statements measuring the characteristics of quality culture are:

- \* Open, continual communication.

(Items 1 - 8)

- \* Obsession with continual improvement.

(Items 9 -17)

- \* Broadbased employee empowerment.

(Items 18 - 21)

- \* Sincere desire for customer input and feedback.

(Items 22 - 27)

- \* Fellow employees are viewed as internal customers.

(Items 28 - 30)

- \* Teamwork approach to problems solving and process



improvement.

(Items 31 - 34)

- \* Recognition and rewards for contribution to quality.

(Items 35 - 36)

- \* Possession of knowledge and skills needed to continuously improve quality.

(Items 37 - 38)

The basic data are obtained from items which are designed to tap the elements of each characteristic of quality culture. The scores for the items measuring each characteristic are measures of the extent of the particular quality culture characteristic.

The biographic data of job position enable scores to be stratified into management, supervisor and operator levels for investigating the extent of quality culture at different levels.

### **3.4.3 Scaling Methods**

The respondents are requested to indicate degree of agreement or disagreement with a variety of items about his/her organization. The following scheme is used :

Strongly agree	= 6
Agree	= 5
Slightly agree	= 4
Slightly disagree	= 3
Disagree	= 2
Disagree	= 1

The scheme is designed to exclude possibilities of neutral responses as respondents shall either agree or disagree (to a variable degree) as to the existence of quality culture characteristics.

#### 3.4.4 Administration Of The Questionnaire

Questionnaires were distributed personally to all the supervisors of four departments and managers in GLT. The supervisors were briefed on how to respond to the questionnaires and they had to get back to their operators and explain to them.

A list of all the employee numbers and names of operators was obtained from the Human Resource Department. The employee number of each operator was written on a small piece of paper and it was put in a box. A total of eighty numbers were drawn randomly from