A STUDY OF TOTAL QUALITY MANAGEMENT APPROACH FOR HONG KONG INDUSTRIES

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ABSTRACT

A brief introduction to the history of Hong Kong, its economic achievements as well as its developments in total quality management is given. A review on the work of gurus and experts in TQM is also given.

Founded on the Kanji/Asher's Quality Pyramid, a Cultural Model of TQM is developed and a method to compare, objectively, the seven TQM Gurus' principles with a spectrum of eight TQM dimensions is proposed.

A survey on the principle and practice of TQM in the manufacturing industries of Hong Kong was conducted using a Chinese/English bilingual questionnaire. The design of the questionnaire was based on the development of the Cultural Model. Also, pitfalls in the implementation process of TQM were studied through two local cases, Wo Kee Services Limited and SKF China Ltd. Pitfalls encountered by each and both of them are described with suggested remedies given.

It is noted that the Core Concept INTERNAL CUSTOMER IS REAL is not receiving sufficient attention from industry. The 1-way ANOVA reveals that management considers the importance of product quality, handling of complaints, product functions, market price, warranty and service after sales to override other competitive parameters. FACTOR ANALYSIS reveals three underlying visions on competitive parameters by management and they are **management vision** on *quality aspects aimed at meeting customer satisfaction*, on *better service and promotion*, and on *better choice available to customers*. The results, in general, indicate that the Cultural Model fits well in the Hong Kong context.

It is also noted that the common pitfalls encountered in the two case studies are the *lack of management commitment*, the *lack of proper training*, the *lack of involvement of staff* and the *resistance to change from performance through management to performance through people*.

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1. INTRODUCTION

Quality is a word employed so much in the mass media nowadays that one would take for granted that its attainment is a sine qua non as firms fight for competitive advantage in a consumer-based market economy. Even the communist China can no longer ignore the significance of quality management approaches.

In this competitive business world, business activities are complex and fast-moving under the swift-changing world economy that make the management of change crucial and vital for corporate survival. Today, the market for almost any product may be anywhere in this world and, supplies may come from almost anywhere — the tiny clock of Deming (1993, pp.2) had these words inscribed: "Assembled in China with Swiss parts made in Hong Kong." And Total Quality Management (TQM) provides the opportunity to manage the change and delight the customers.

In fact, the search for, and admiration of, quality through fine craftsmanship is not confined to people of modern times, and it was particularly so in ancient times but was primarily a privilege enjoyed by the king, the royal family and the nobles. Things that were highly praised in the past become antiques of great value today and that cannot happen without dual recognition of quality. Even beer brewed from the Egyptian method of 2 000 BC costs £50 a bottle with the first bottle costing £5,000, irrespective of its quality (Reuters, London, 25/6/1996; Ming Pao Daily News 26/6/1996 — in Chinese).

In this chapter, a brief history of Hong Kong is outlined, followed by its economic achievements, apart from its many entries in the Guinness Book of Records, then its developments in TQM and finally the aims of study.

1.1 HISTORIC BACKGROUND OF HONG KONG

Beginning in the 1920s, archaeological studies in Hong Kong have uncovered evidence of ancient human activities at many sites along the winding shoreline, testifying to events of over 6 000 years. Interesting features from excavations include stone tools, pottery and other artefacts which form an insight into the lives of Hong Kong's ancient inhabitants around 4 000 BC; bronze artefacts like swords, arrowheads, socketed axes and fish hooks, pottery and rock carvings of around 2 000 BC at Shek Pik on Lantau Island, on Kau Sai Chau, Po Toi, Cheung Chau and Tung Lung Island.

In its early days, the territory was regarded as an uninviting prospect for settlement. A population of about 3,650 was scattered over 20 villages and hamlets, and 2,000 fishermen lived on board their boats in the harbour. Its mountainous terrain, deficient in fertile land and water, meant that Hong Kong possessed only one natural asset — a fine and sheltered anchorage. It was that harbour which accounted for the British presence which began in the 1840s, Victoria Harbour was strategically located on the trade routes of the Far East, and was soon to become the hub of a burgeoning *entrepôt* trade with China.

Hong Kong's development into a commercial centre began with the founding of a settlement under the British flag in 1841. At the end of the 18th century, the British dominated the foreign trade at Canton (Guangzhou)

but found conditions unsatisfactory with residential and other restrictions — they were forbidden to learn the Chinese language or to enter the city except during the trading season. Shipping dues were arbitrarily varied and, generally, much bickering resulted between the British and the Chinese traders. Yet, there was mutual trust and the spoken word alone was sufficient for even the largest transactions.

Trade had been in China's favour and silver flowed in until the growth of the opium trade — from 1800 onwards — reversed this trend. The outflow of silver became more marked from 1834, after the East India Company lost its monopoly of the China trade, and the foreign free traders, hoping to get rich quickly, joined the lucrative opium trade which the Chinese had made illegal in 1799. This led to the appointment of Lin Zexu (Lin Tse-hsu) in March 1839 as special Commissioner in Canton to stamp out the opium trade. These actions instigated the Opium War and, subsequently, Hong Kong was ceded to Britain under the Convention of Cheunpi (Chuanbi) signed on January 20, 1841.

The new settlement did not go well at first. It attracted unruly elements, while fever and typhoons threatened life and property. Crime was rife. The population rose from 32,983 (31,463 Chinese) in 1851 to 878,947 (859,425 Chinese) in 1931. The Chinese influx was unexpected. They asked only to be left alone and thrived under a liberal British rule. Hong Kong became a centre of Chinese emigration and trade with Chinese communities abroad. Ocean-going shipping using the port increased from 2,889 ships in 1860 to 23,881 in 1939.

Public and utility services developed — the Hong Kong and China Gas Company in 1861, the Peak Tram in 1885, the Hongkong Electric

Company in 1889, China Light and Power in 1903, the electric tramways in 1904 and the then government owned Kowloon-Canton Railway, completed in 1910. Successive land reclamations began in 1851.

Public education began in 1847 with grants to the Chinese vernacular schools. In 1873, the voluntary schools — mainly run by missionaries — were included in a grant scheme. The College of Medicine for the Chinese, founded in 1887, developed into the University of Hong Kong in 1911 and offered arts, engineering and medical faculties.

After the Japanese surrender at the end of the Second World War, Chinese civilians — many of whom had moved into China during the war — returned at the rate of almost 100 000 a month. The population, which by August 1945 had been reduced to about 600 000, rose by the end of 1947 to an estimated 1.8 million. In 1948-49, as the forces of the Chinese Nationalist Government (Kwomantung) began to face defeat in the Chinese civil war at the hands of the communists, Hong Kong received an influx unparalleled in its history. Hundreds of thousands of people — mainly from Kwangtung (Guangdong) Province, Shanghai and other commercial centres — entered the territory during 1949 and the spring of 1950. By mid-1950, the population had swelled to an estimated 2.2 million. It has continued to rise and now stands at over six million.

After a period of economic stagnation, started in early December 1950 (Hong Hong Annual Report 1951, pp.7-8) and caused by the United Nations' embargo on trade with China, Hong Kong began to industrialise. No longer could the territory rely solely on its port to provide prosperity for its greatly increased population. From the start, the industrial revolution was based on cotton textiles, gradually adding woollens and, in the late

1960s, man-made fibres and made-up garments to the list. Textiles and clothing make up around 40 per cent of domestic exports by value. Electronic products, watches and clocks, and printing are also important industries.

Hong Kong continued to expand its role as an entrepôt with its neighbours and trade with China was no exception. Coupled with tourism, this led to vast improvements in communications, with an increasing number of people entering China from or through Hong Kong each year. One of the territory's carriers, Hong Kong Dragon Airlines, and three Chinese airlines — China Southern Airlines, Air China and China Eastern Airlines — operate scheduled and non-scheduled services between Hong Kong and cities in China. Three other Chinese airlines — China National Aviation Corporation, China Northern Airlines and China Northwest Airlines — operate non-scheduled services between Hong Kong and destinations in China.

To keep pace with these developments, the Hong Kong Government places strong emphasis on infrastructure improvements. As a result, the territory has been transformed into a modern city with efficient road and rail links, tunnels and flyovers. New highways have opened up previously remote areas. A 1 248-hectare new airport at Chek Lap Kok on Lantau Island is under construction to replace the already saturated international airport at Kai Tak.

The development of Hong Kong's economic base has enabled the Government to increase spending on housing, education, social welfare and health over the years from $19,333 million in 1985-86 to an estimated $95,940 million in 1995-6. (Howlett, 1996, pp.249-252, 402-410)

1.2 ECONOMIC ACHIEVEMENTS OF HONG KONG

Hong Kong has a deep-water harbour and is strategically located on the international time zone between Asia and Europe. It is close to China and has strong traditional links with Southeast Asian economies. Hong Kong also has a low tax environment, free and fair market competition, a sound legal and financial framework, a fully convertible and secure currency, highly efficient transport and communication networks and, most importantly, a competent workforce and a pool of enterprising entrepreneurs.

Over the past two decades, the Hong Kong economy has more than quadrupled in size. With its GDP growing at an average annual rate of 7.5 per cent in real terms, Hong Kong has outperformed the member countries of the Organisation for Economic Co-operation and Development (OECD) and has been growing more than twice as fast as the world economy. Per capita GDP has tripled in real terms, equivalent to an average annual growth rate of about 6 per cent in real terms. Valued at US$23,000 in 1995, Hong Kong's per capita GDP surpassed that of the United Kingdom, Canada and Australia, and was next only to Japan in Asia.

Manufacturing establishments in Hong Kong are generally small. There were 31 114 manufacturing establishments in 1995, of which 29 821 employed fewer than 50 persons while the remaining 1 293 accounted for 49.6 per cent of Hong Kong's total manufacturing employment. The manufacturing sector remains export-oriented: about 80 per cent of the products manufactured were exported. Domestic exports amounted to HK$231,657 million in 1995. Major export items include clothing (31.9%), electronics (27.7%), textiles (6.1%), watches and clocks (5.9%), chemical products (4.0%) and jewellery (2.5%). Hong Kong is one of the world's

leading exporters of clothing. It was also the largest exporter of watches by quantity and the second-largest exporter of watches by value in 1993. (Dunn (1996) and Howlett (1996), pp. 94)

Tourism remained the second-largest earner of foreign exchange. Hong Kong welcomed a record 10.2 million visitors in 1995 with tourism receipts amounting to over $72 billion, representing a contribution of some six per cent to Hong Kong's GDP. (Howlett, 1996, pp.250, 301)

Hong Kong is now ranked the eighth-largest trading entity in the world. It operates the busiest container port in terms of throughput. Its airport is the fourth-busiest in terms of the number of international passengers and the second-busiest in terms of the volume of international cargo handled. It is also the world's fifth-largest banking centre in terms of the volume of external banking transactions, and the fifth-largest foreign exchange market after the United Kingdom, the United States, Japan, and Singapore, in terms of turnover. With 542 public companies listed on the Hong Kong Stock Exchange Limited and a total market capitalisation of $2,348 billion, Hong Kong's stock market is ranked eighth in the world and second in Asia in terms of market capitalisation. In addition, the Chinese Gold and Silver Exchange Society operates one of the largest gold bullion markets in the world, with turnover totalled 18 million taels (one tael equals approximately 1.2 troy ounces) in 1995. All these show that Hong Kong has firmly established itself as a major international trade and financial centre. The World Competitiveness Report 1995, published by the International Institute for Management Development and the World Economic Forum, ranks Hong Kong as the third most competitive economy in the world (compared with fourth the previous year), after the USA and Singapore. The US Heritage Foundation also identified Hong Kong, out of

140 economies studied, as the freest economy in the world for the second consecutive year. (Dunn, 1996; Howlett, 1996, pp. 48, 79-80)

According to Forbes' 1996 list of the world's wealthiest people, there are 20 billionaires living in the territory which puts it in fourth place on a country-by-country breakdown of where the richest people live — behind the United States, Germany and Japan. Amongst them, Mr. Lee Shau-kee (Henderson Land Development) is the richest in Asia and the fourth-richest in the world — behind Bill Gates (Microsoft, USA), Warren Buffett (Berkshire Hathaway, USA) and Paul Sacher (Roche, Switzerland) — and Mr. Li Ka-shing (Hutchison Whampoa, Cheung Kong) is the third-richest in Asia and the sixth-richest in the world. (Asami et al, 1996; Tabakoff, 1996; Ming Pao Daily News of 2/7/1996 — in Chinese)

As at June 30, 1995, Hong Kong has a total asset of US$53.6 billion in its exchange fund which is ranked seventh amongst great nations in the world in terms of national reserve fund — behind Japan, Tai Wan, Germany, the United States, China and Singapore — and second (US$8,933 per capita) on a per capita basis next only to Singapore. (Ming Pao Daily News 8/8/1995 — in Chinese)

All these authentic achievements have been made in Hong Kong under British rule and Hong Kong quality culture itself is a particularly interesting subject of study.

1.3 DEVELOPMENTS OF TOTAL QUALITY MANAGEMENT IN HONG KONG

Quality promotion in Hong Kong began in 1979 when the Government was asked to build up infrastructure for industry. In 1988,

consultants were asked to produce a study on what else could be done, and the Government accepted the study's recommendation to undertake promotion of quality management systems such as ISO 9000 and TQM. As a result, the Industry Department's Quality Assurance Unit was established in 1989 to undertake the task. (Serjeant, 1994)

With the growing needs and demands for quality assurance of products, and quality management system in particular, from overseas buyers, the Industry Department of Hong Kong launched its first ever **Quality Awareness Campaign** under the slogan "**make it better in Hong Kong**" and was officiated by the then-governor Sir David Wilson in March 1990, with simple message: *investment in quality is one of the wisest business decisions a manufacturer can make.* The main targets of the campaign were the 2 500 largest manufacturing companies in Hong Kong, which accounted for about 55 per cent of gross manufacturing outputs. A **'top-down approach'** was emphasized. The core of the campaign message was that *sound quality management would lead directly to improved productivity, profitability and competitiveness.* Companies like Motorola Semiconductors Hong Kong Ltd., Outboard Marine Asia Ltd., Shui On (Contractors) Ltd., China Light & Power Co. Ltd., the Printing and Housing Departments of the Hong Kong Government were at various stages along the road to, what was called at the time, **Total Business Management**. Their reasons for striving for total business management were due to customer pressure (Lee, 1995) and the desire to survive and prosper. To promote a wider appreciation of the importance of quality amongst Hong Kong manufacturers, the *Governor's Award for Industry (Quality)* was organised annually. Awards are made to recognise and reward manufacturers who have shown, over the past year, effective quality

management and products manufactured to a high standard of quality. Entrants for the Award may choose one of the following six product categories: clothing, electronic and electrical products, textiles, watches and clocks, toys and dolls and miscellaneous manufactured products. The winning entry in each category is awarded the Industry Department **Quality Award**. Of the six winning entries, the most outstanding one receives the **Hong Kong's Award for Industry (Quality)** — formerly known as the Governor's Award for Industry (Quality) prior to 1995 (Quality Quest, 1995). In addition to the Quality Award, there are annual awards for Machinery/Equipment Design, Consumer Products Design and Productivity, which are organised by the Chinese Manufacturers' Association, the Federation of Hong Kong Industries and the Hong Kong Productivity Council respectively. (Mortiboys, 1990, pp.1-5, 16, 73)

Apart from the many consultancy firms offering TQM services, there are a number of establishments funded/subvented by the government to help instrument calibration, product testing, promotion and certification of quality management system. A brief introduction to these establishments is given below:

- **Hong Kong Government Standard and Calibration Laboratory (SCL)** was set up in 1984 to maintain for Hong Kong standards of measurements which are directly traceable to the highest international reference standards [e.g. National Physical Laboratory (NPL) of UK and National Institute of Standards and Technology (NIST) of USA]. It provides a calibration service to enable manufacturers to meet the measurement standards required for their products and has been accredited by the UK's National Measurement and Accreditation Service (NAMAS) for a whole range of measurement parameters.

- **Hong Kong Laboratory Accreditation Scheme (HOKLAS)** was launched in 1985 with prime objectives being to upgrade the management and standard of testing in local laboratories and to confer official recognition on those laboratories found to be competent. It also promotes the acceptance of test results from accredited laboratories and provides the user of such services with an added confidence in the reliability of the test results. HOKLAS is operated in accordance with International Organisation for Standardisation (ISO) guidelines and is recognised as an established and mature scheme by the laboratory accreditation community worldwide. The scheme covers the accreditation of tests on electrical and electronic products, textiles and garments, toys, food, construction materials, environmental testing, chemical testing and calibration services.

- **Product Standards Information Bureau (PSIB)** provides an information service to industry on overseas product safety, health and certification standards requirements. Open to the public, the Product Standards Library maintains a collection of over 80 000 national standards issued by Hong Kong's major overseas trading partners together with international standards issued by ISO and International Electrotechnical Commission (IEC). The library also keeps national regulations and other relevant information concerning product safety, testing and certification requirements. Since April 1987, copies of overseas standards and documents can be purchased at the bureau.

- **Hong Kong Quality Assurance Agency (HKQAA)** was established in 1990 to assist manufacturers in meeting the growing international requirement for third-party certification under a voluntary factory certification scheme with Government recognition being conferred on

organisations adopting quality management systems conforming to the ISO 9000 series. The agency is governed by a Council comprising leading industrialists, quality experts and representatives of the Industry Department and major trade and industrial organisations. The modus operandi of the certification scheme is based on the Quality System Assessment Registration Scheme (QUASAR) operated by BSI. The agency, with the assistance of a cadre of expert assessors, undertakes in-depth appraisal of the applicant-firm's quality management system against the appropriate ISO 9000 series standards. Upon rectification of any non-conformity found during the assessment, recommendations are made to the Government for the award of certification. Regular surveillance will be carried out thereafter to ensure that standards are maintained.

- **Hong Kong Q-Mark Council**, with its Q-mark scheme established in 1978 through the enactment of legislation, is an impartial third-party quality certification and product-marking organization the objective of which is to promote and foster local industrial development through quality enhancement of both product standards and manufacturing systems in compliance with international recognised standards. It also provides technical consultancy and product inspection services. Hong Kong- made goods which qualify for the granting of the HKQ-mark are manufactured to a recognised, approved standard, under a quality control system, and finally tested by an independent third-party. Regular quality surveillance is maintained by the council thereafter.

In addition, the Industry Department holds **Quality Week**, generally, in June each year, to promote quality management applications amongst industries and to afford recognition to their achievements. All these

manifest the Government's determination and commitment to foster TQM in Hong Kong (Liu, 1995) and to meet the challenges of the 21st century.

On the research front, Hong Kong took off as the Government started to promote TQM in 1990. Koo (1995) outlined the history of quality circles or quality control circles (QCCs) and offered an assessment of the success and failure of QCCs in Hong Kong. He found that the reasons for QCCs to be successful are:

- ♦ Employees believe that their support and participation will benefit themselves as well as the organisation.
- ♦ Participants in QCCs must be well trained in group dynamics and quality control (QC) problem-solving tools.

The reasons for failure of QCCs in most companies are:

- ◊ Either or both the management and employees are sceptical about the benefits of QCCs (i.e. the win-win situation is not perceived).
- ◊ Proper and adequate training about QCC is lacking.
- ◊ Design of QCC programmes does not meet the organisational requirements.
- ◊ The QCC programme has duplicated other system improvement schemes.
- ◊ The support from top management is *ad hoc* and not lasting.

From the membership survey conducted by the Hong Kong Quality Management Association, it was found, using multiple regression analysis, that the determinants for "good quality management" were first, **middle management commitment** and, second, **top management support** in

quality management activities; findings in accord with most of Chan and Tang (1994).

Characteristics pertinent to fostering good quality culture in the manufacturing industries of Hong Kong were studied by Liu (1995). The characteristics considered were:

i. availability and usage of a quality document(s);

ii. availability of a quality handbook;

iii. participation in defining quality goals;

iv. participation in design review;

v. methods used to identify quality problems and causes, and;

vi. participation in a regular audit of quality control efforts and results.

It was found that top management participated most in defining quality goals, in design review during development of new products and in regular audit of quality efforts and results; customer needs are the primary criteria used to identify latent quality problems and causes. Liu (1995) concluded that quality culture in the manufacturing industries of Hong Kong is flourishing in the right direction and repaying the investment made by the Government in quality initiatives.

In a survey of all companies certified by HKQAA, Lee (1995) studied the experience of implementing ISO 9000 in Hong Kong. He found that the majority of building and construction firms adopted ISO 9000 because their customers had asked for it. Findings pertinent to companies eager for certification are listed below:

* ISO 9000 system was applicable to all sectors of industry.

* Success in implementing ISO 9000 was not affected by company size.

* Company might be certified successfully both with and without the assistance of consultants.

* Recruitment of additional staff members to implement ISO 9000 was not essential.

* Dramatic short-term benefits from certification should not be expected.

* Cost of installing and maintaining the quality assurance management system was not considered to be expensive.

* Pre-audit conducted by certifying body was useful.

In a study of total quality in purchasing, A.S.H.Wong (1995) found that purchasing professionals in Hong Kong put more emphasis on quality than on price and that total quality in purchasing can help ensure the procurement and provision of quality materials which will directly affect the final product quality. In essence, quality was an important key to cutting cost, often substantially.

Y.L.Wong (1995) studied the quality strategy of small businesses in Hong Kong. The results indicated that implementation of TQM in these business concerns was unsatisfactory. Despite initial enthusiasm, there were misunderstandings of the concept of TQM.

There are differences between Hong Kong and Japan, reported M.M.L.Wong (1995) in a study of graduate training programmes are Japanese organisations in Hong Kong. Graduate training programme is an important process for Japanese organisational learning. The direct transplanting of such processes to Japanese organisations in Hong Kong becomes difficult and insufficient to prepare the ground for organisational learning without the background of the 'soft learning' socio-cultural

environment in the host country. This phenomenon perhaps explains why implementation of TQM does not induce the desired benefits as advocated; because it is a foreign transplant from a Japanese culture (Lo and Tong, 1995; Tang and Maule, 1995).

The recent development of SERVQUAL has provided an instrument for measuring service quality that would apply across a broad range of services. In assessing the validity of SERVQUAL, using empirical data from Hong Kong, Lam (1995) found that the scale appears to be a consistent and reliable measure of service quality. The scale exhibits reliable and valid measure of customers' expectations of bank services and their perceptions of the bank's performance level. Areas for attention to improve bank's service quality are pinpointed.

Realising that the key to success lies profoundly in "Company Culture", Lo and Tong (1995) gave an account of their company's, the Computer Product Asia-Pacific Ltd., experience on the road to TQM. In order to upgrade the company to best meet the needs of the ever-changing electronics market, employees were rallied to a common vision and in mid-1988 the concept of **'3C'— charge, challenge, change** — was promoted. The Hong Kong plant was upgraded from a manufacturing centre to a business division and Asia-Pacific headquarters in 1989. The company decided to go for the ISO 9001 in mid-1990 and was the first Hong Kong company to be awarded the ISO 9001 certification in 1991.

Similarly, Tang and Maule (1995) described the experience of a public corporation, the Mass Transit Railway Corporation (MTRC), in achieving a **total customer service culture**. The steps taken were shaping the culture; setting core values — *customer service, respect for the*

individual, on time and within budget; diffusing the vision and values; aligning behaviour; setting targets and standards; recruiting the right people and training; maintaining good performance; communicating internally and with passengers; and, finally, giving recognition and recognising achievement. For three years (1991, 1992 and 1995) the MTRC won the Hong Kong Management Association's "**Award for Excellence in Training**" and, was awarded **Communicator of the Year** by the International Association of Business Communicators in 1992 and again in 1994.

1.4 AIMS OF STUDY

The purpose of this research is to study the TQM approach and to develop a TQM process (i.e. Principle, Strategy, Culture, Process and Methods) for Hong Kong manufacturing and service industries.

In order to do so, the author has reviewed the literature on TQM, i.e. the work of Gurus and experts, in chapter 2; developed a TQM model in chapter 3 using the basic principles of TQM; described the methodology on questionnaire design, sampling design and techniques used for analysis in chapter 4; reported the results in chapter 5; for the two case studies, pointed out pitfalls of TQM in chapter 6, and; made conclusions in chapter 7.

2. PRINCIPLES OF TOTAL QUALITY MANAGEMENT

The total-quality movement had its roots in time and motion studies conducted by Frederick Taylor, who is known as "the father of scientific management," in the 1920s. The most fundamental aspect of scientific management was the separation of planning, the job of management, and execution, the job of labour, from the old concept of craftsmanship in which a highly skilled individual performed all tasks required to produce a quality product. As the volume and complexity of manufacturing increased, quality became an increasingly problematical issue. Volume and complexity together gave birth to quality engineering in the 1920s and reliability engineering in the 1950s. Quality engineering, in turn, gave birth to the use of statistical methods in the control of quality, which eventually led to the concepts of *control charts* and *statistical process control* (SPC); first introduced by Walter A. Shewhart in 1931, and which now constitute one of the fundamental aspects of TQM. (Goetsch and Davis, 1994, pp.8-10.)

Though SPC originated in the United States, it was in Japan, with its peculiar tradition of life-long employment and in a devastated state after the Second World War, where Drs. W. E. Deming and J. M. Juran in particular were most closely listened to for their advocacy of quality in the rebuilding of war damaged industries (Kanji, 1990). Quality circles were voluntarily formed to discuss initially production problems faced on the shopfloor and subsequently product quality. These early steps were later extended to company-wide quality control (CWQC) and developed into the framework for TQM.

Total quality is not just one individual concept. It is a number of related concepts pulled together to create a comprehensive approach to doing business. Many people contributed in meaningful ways to the development of the various concepts that are known collectively as ***total quality***. The three major contributors are W. Edwards Deming, Joseph M. Juran and Philip B. Crosby. To these three, many would add Armand V. Feigenbaum, Gopal K. Kanji and a number of Japanese experts, such as Kaoru Ishikawa and Genechi Taguchi. The work of gurus and experts of TQM can be found in most TQM literature and they are briefly described in this chapter. (Goetsch and Davis, 1994, pp.18.)

Unlike Deming (1993, pp.2)'s tiny clock, the wrist watch of Oakland (1993, pp.4-5) has been insulted all over the world on its quality. Most often quality is defined differently according to different people but they all converge to *meet customer requirements*. Oakland (1993, pp.5) gives some of the expressions made on quality by other authors:

- '*Fitness for purpose or use*' — **Juran**
- '*The totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs*' — **BS 4778, 1987 (ISO 8402, 1986) Quality Vocabulary: Part 1, International Terms**.
- '*Quality should be aimed at the needs of the customer, present and future*' — **Deming**.
- '*The total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectation by the customer*' — **Feigenbaum**.
- '*Conformance to requirements*' — **Crosby**.

The key principles of nine TQM authorities were compared by Field (1996, pp.26-69) with the nine elements of the European Quality Award based on the European Foundation for Quality Management (EFQM) model. The result of the comparison indicated that **leadership**, **people management**, **process** and **people satisfaction** are the most important issues in TQM; and that *policies*, *strategies* and *resources* must also be in place for excellence to be seen in the areas of customer satisfaction, impact on society and business results.

2.1 DEMING

Of the various TQM gurus, Dr. W. Edwards Deming is perhaps the best known. According to Deming's biographer Andrea Gabor (1990, pp.16),

> Deming also has become by far the most influential proponent of quality management in the United States. While both Joseph Juran and Armand V. Feigenbaum have strong reputations and advocate approaches to quality that in many cases overlap with Deming's ideas, neither has achieved the stature of Deming. One reason is that while these experts have often taken very nuts-and-bolts, practical approaches to quality improvement, Deming has played the role of **visionary**, distilling disparate management ideas into a compelling new philosophy.

Deming (1986) defines quality as **a predictable uniformity and dependability at low cost and suited to the market**. His contributions to the quality movement would be difficult to overstate. Many considered him the father of the movement. The things for which he is most widely known are the **Deming Cycle**, the **Fourteen Points**, and the **Seven Deadly Diseases**. (Goetsch and Davis, 1994, pp.20)

2.1.1 The Deming Cycle

The ability to define and carry out continuous improvement processes are central to the success of TQM. The Deming cycle (see figure 1) or Deming wheel (Kanji, 1990) and sometimes called the Shewhart cycle (Wood and Munshi, 1991) was developed to meet these needs.

Source: Kanji (1990, pp.6)

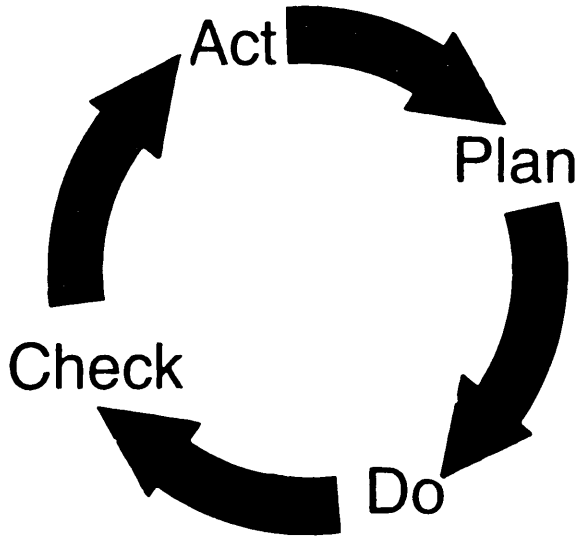

Figure 1: *The Deming Cycle*

In the Deming cycle, the *plan* defines the process which ensures documentation and sets measurable objectives against it; the *do* executes the process and collects the information required; the *check* analyses the information in suitable format; the *act* obtains corrective action using total quality management techniques and methods and assesses future plans (Kanji, 1990). Further, the Deming cycle can be expanded, as Kondo (1977) and Hildebrandt et al (1991) have demonstrated, to suit individual circumstances.

2.1.2 The Deming's Fourteen Points

Deming's philosophy is both summarised and operationalised by his Fourteen Points. Peter R. Scholtes (1992, pp.2-4) describes Deming's Fourteen Points as follows:

> Over the years, Dr. Deming has developed 14 points that describe what is necessary for a business to survive and be competitive today. At first encounter, their meaning may not be clear. But they are the very heart of Dr. Deming's philosophy. They contain the essence of all his teachings. Read them, think about them, talk about them with your co-workers or with experts who deeply understand the concepts. And then come back to think about them again. Soon you will start to understand how they work together and their significance in the true quality organisation. Understanding the 14 points can shape a new attitude toward work and the work environment that will foster continuous improvement.

Deming has modified the specific wording of various Points over the years, which accounts for the minor differences among the Fourteen Points as described below:

1. Create *constancy of purpose* toward the improvement of products and services in order to become competitive, stay in business, and provide jobs.
2. Adopt *the new philosophy*. Management must learn that it is a new economic age and awaken to the challenge, learn their responsibilities, and take on leadership for change.
3. *Stop depending on inspection* to achieve quality. Build in quality from the start.
4. *Stop awarding contracts on the basis of low bids.*

5. *Improve continuously and forever* the system of production and service, to improve quality and productivity, and thus constantly reduce costs.
6. *Institute training on the job.*
7. *Institute leadership.* The purpose of leadership should be to help people and technology work better.
8. *Drive out fear* so that everyone may work effectively.
9. *Break down barriers* between departments so that people can work as a team.
10. *Eliminate slogans, exhortations, and targets* for the workforce. They create adversarial relationships.
11. *Eliminate quotas and management by objectives.* Substitute leadership.
12. *Remove barriers that rob employees of their pride* of workmanship.
13. *Institute a vigorous programme of education* and self-improvement.
14. *Make the transformation everyone's job* and put everyone to work at it (through top management commitment and empowerment).

Deming has stated repeatedly in his later years that if he had it all to do over again he would leave off the numbers. Many people, in Deming's opinion, interpret numbers as an order of priority or progression when this, in fact, is not the point: The numbers represent neither an order of progression nor relative priorities. (Goetsch and Davis, 1994, pp.22)

2.1.3 The Seven Deadly Diseases

The Fourteen Points summarise Deming's views on what a company must do to effect a positive transition from business-as-usual

to world-class quality. His Seven Deadly Diseases summarise Deming's view of factors that can inhibit such a transformation and are listed below:

1. Lack of constancy of purpose to plan products and services that have a market sufficient to keep the company in business and provide jobs.
2. Emphasis on short-term profits; short-term thinking that is driven by a fear of unfriendly takeover attempts and pressure from bankers and shareholders to produce dividends.
3. Personal review system for managers and management by objectives without providing methods or resources to accomplish objectives. Performance evaluations, merit ratings, and annual appraisals are all part of this *disease*.
4. Job hopping by managers.
5. Using only visible data and information in decision-making with little or no consideration given to what is not known or cannot be known.
6. Excessive medical costs.
7. Excessive costs of liability driven up by lawyers that work on contingency fees.

The description of these factors rings particularly true when viewed from the perspective of US firms trying to compete in the global marketplace. Some of these factors can be eliminated by adopting the total-quality approach, but three of them cannot. Total quality can eliminate or reduce the impact of a lack of consistency, personal review systems, job hopping, and using only visible data. However, total

quality will not free corporate executives from pressure to reduce short-term profits, from excessive medical costs, or from excessive liability costs. (Goetsch and Davis, 1994, pp.22-23)

2.2 JURAN

Joseph M. Juran ranks near Deming in the contribution he has made to quality and the recognition he has received as a result. He received the Order of the Sacred Treasure medal, from the Emperor of Japan, in recognition of his efforts to develop quality in Japan and for promoting friendship between Japan and the US. Juran defines quality as **fitness for use** (Juran, 1989, pp.15) and is best known for the following contributions to the quality philosophy:

- Juran's Three Basic Steps to Progress.
- Juran's Ten Steps to Quality Improvement.
- The Pareto Principle.
- The Juran Trilogy.

2.2.1 Juran's Three Basic Steps to Progress

Juran' Three Basic Steps to Progress are broad steps that, in Juran's opinion, companies must take if they are to achieve world-class quality and they are listed below: (see Uselac, 1993, pp.37)

1. Achieve structured improvements on a continual basis combined with dedication and a sense of urgency.
2. Establish an extensive training programme.
3. Establish commitment and leadership on the part of higher management.

Also, Juran believes there is a point of diminishing return that applies to quality and competitiveness as illustrated in the following example.

> Say that an automobile maker's research on its mid-range line of cars reveals that buyers drive them an average of 85,000 kilometres before trading them in. Applying Juran's theory, this automaker should invest the resources necessary to make this line of cars run trouble-free for perhaps 100,000 kilometres. According to Juran, resources devoted to improving quality beyond this point will run the cost up higher than the typical buyer is willing to pay. (Goetsch and Davis, 1994, pp.24)

This provides a logical, feasible and reachable objective for both workers and management to meet, and servers as a lighthouse for the voyagers in search of quality. Certainly the limit can be altered in accordance with the changing customer expectations.

2.2.2 Juran's Ten Steps to Quality Improvement

Examining Juran's Ten Steps to Quality Improvement, one will see some overlap between them and Deming's Fourteen Points. They also mesh well with the philosophy of other quality experts and are listed below: (see Uselac, 1993, pp.37)

1. Build awareness of both the need for improvement and opportunities for improvement.
2. Set goals for improvement.
3. Organize to meet the goals that have been set.
4. Provide training.
5. Implement projects aimed at solving problems.
6. Report progress.
7. Give recognition.

8. Communicate results.
9. Keep score.
10. Maintain momentum by building improvement into the company's regular systems.

2.2.3 The Pareto Principle

> "This principle is sometimes called the 80/20 rule: 80% of the trouble comes from 20% of the problems. Though named for turn-of-the-century economist **Vilfredo Pareto**, it was Dr. Juran who applied the idea to management. Dr. Juran advises us to concentrate on the 'vital few' sources of problems and not be distracted by those of lesser importance." (Scholtes, 1992, pp.2-9)

The Pareto Principle espoused by Juran (1993, pp.48) shows up in the views of most quality experts. According to this principle, organisations should concentrate their energy on eliminating the vital few sources that cause the majority of problems. Further, both Juran and Deming believe that systems that are controlled by management are the systems in which the majority of problems occur (Kanji, 1996). (Goetsch and Davis, 1994, pp.25)

2.2.4 The Juran Trilogy

Quality Planning, Quality Control and Quality Improvement form the trilogy as Juran (1989, pp.82) defines quality management.

Quality planning involves developing the products, systems, and processes needed to meet or exceed customer expectations, minimise product dissatisfaction, avoid costly deficiencies (costly redoing of prior work), optimise company performance and, provide participation for those who are affected.

Quality control is defined as a managerial process to meet established quality goals, detect departures from planned levels of performance and, restore performance to the planned levels; during which actual performance is evaluated, actual performance to goals is compared and, action on the differences is taken.

Quality improvement should be an on-going and continual process to develop the infrastructure necessary to make annual quality improvement; to identify specific areas in need of improvement and implement improvement projects; to establish a project team with responsibility for completing each improvement project, and; to provide teams with what they need to be able to diagnose problems to determine root causes, develop solutions, and establish controls that will maintain gains made.

Source: Juran and Gryna (1993, pp.10)

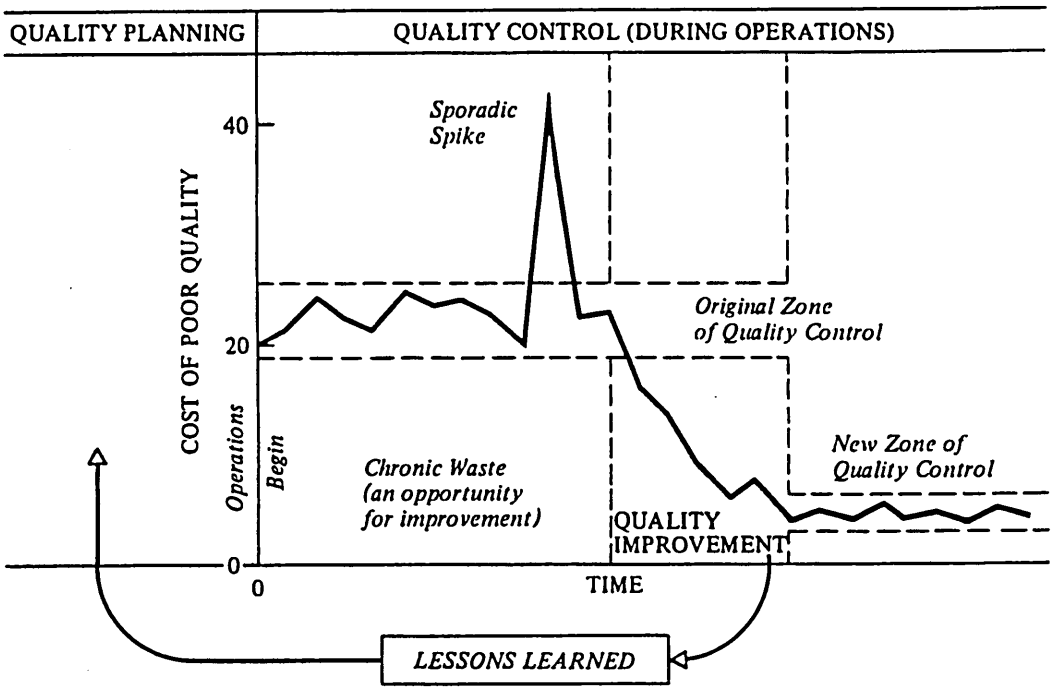

Figure 2: *The Juran Trilogy Diagram*

The three processes of the quality trilogy are interrelated. For example, note the graphic distinction between the noisy *sporadic* quality problem and the muted *chronic* waste (see figure 2 above). 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, 1989, pp.81, 145; Juran and Gryna, 1993, pp.9; Goetsch and Davis, 1994, pp.25-26)

2.3 CROSBY

Philip B. Crosby is the youngster among the big three quality gurus. Crosby (1979) defines quality simply as conformance to requirements and is best known for his advocacy of *zero-defects* management and *prevention* as opposed to statistically acceptable levels of quality. Crosby is also known for his **Quality Vaccine,** his **Four Absolutes of Quality Management,** his **Fourteen Steps to Quality Improvement** and, most currently, his **Four Absolutes of Leadership.**

2.3.1 Crosby's Quality Vaccine

Crosby's Quality Vaccine consists of three ingredients:

1. Determination.
2. Education.
3. Implementation.

This quality vaccine is an abstraction of Crosby's Four Absolutes of Quality Management and his Fourteen Steps to Quality Improvement in its simplest form. It is simple, clear and easily conveyed. (Goetsch and Davis, 1994, pp.27)

2.3.2 Crosby's Four Absolutes of Quality Management

Given below are the Four Absolutes of Quality Management of Philip B. Crosby: (see Rao et al., 1996, pp.43)

1. *Quality means conformance to requirements.* Requirements needed to be clearly specified so that everyone knew what was expected of them.
2. *Quality comes from prevention.* And prevention was a result of training, discipline, example, leadership, and more.
3. *Quality performance standard is zero defects.* Errors should not be tolerated.
4. *Quality measurement is the price of nonconformance.*

These are the main themes to be advocated through education as in Crosby's Quality Vaccine.

2.3.3 Crosby's Fourteen Steps to Quality Improvement

The followings are the Fourteen Steps to Quality Improvement given by Crosby (1996a, pp.185-199):

1. **Management Commitment** (*not tentative but for long-term*).
2. **Quality Improvement Team** (*to face the fact that quality was a problem and to provide a conduit for communication between all those departments who never paid much attention to each other*).
3. **Quality Measurement** (*should begin with the negative things*).
4. **Cost of Quality Evaluation** (*price of nonconformance — money that was not planned to be expended*).
5. **Quality Awareness** (*to let everyone feel that they, as individuals, belong to this new company attitude; to give them information in a positive and open manner setting the tone to changing the culture to one of care and prevention*).

6. **Corrective Action** (*to get everyone in the habit of solving and preventing rather than learning to live with problems*).
7. **Establish an Ad Hoc Committee for Zero Defects Planning** (*to make it clear that management has internalized Zero Defects and will be acting in that way themselves*).
8. **Supervisor Training** (*to internalise concepts, job skills, and information that relates to the way they make their living; the more actual working folks used to conduct classes the better*).
9. **Zero Defects Day** (*to implant the message that this is a different day and help people feel happy about their work; to present peer nominated awards*).
10. **Goal Setting** (*must be specific and measurable*).
11. **Error Cause Removal** (*to help individual employees cause corrective action that affects their work and to create a Zero Defects environment around the workplace*).
12. **Recognition** (*must be dignified and must come from peers*).
13. **Quality Councils** (*different from "teams" in that they are essentially making functional policy while accomplishing the educational and self-help activities necessary to support that policy; all that is need is a common interest in some subject*).
14. **Do It Over Again** (*to appoint new Quality Improvement Team and the baton passed from old to new; leave no one on for continuity*).

Step 1 refers to the Determination and steps 2 to 14 refer to the Implementation of Crosby's Quality Vaccine.

2.3.4 Crosby's Four Absolutes of Leadership

Crosby (1996b) comments that all of us are involved in leading which goes with every level of responsibility and gives his Four Absolutes of Leadership as follows:

1. The leader has a clear agenda. (*Where are we going? Why? How will we know when we get there?*)
2. The leader has a personal philosophy of management. (*What is quality? What is finance? What are relationships?*)
3. The leader builds enduring relationships. (*Employees, suppliers, customers, community, they all learn to relate the leader in a positive way*)
4. The leader is worldly. (*The five billion people on earth do not all live in our respective cities but we all live in a world community, there is a world economy, and it affects everything we do*)

Compared with Deming and Juran, Crosby's Fourteen Steps to Quality Improvement still lacks monitoring. Without measurement or use of SPC, monitoring of improvements is difficult if not impossible.

"Quality is free" is a powerful propaganda of Crosby's to attract attention in the business sector. In a business sense, nothing comes free. The equation 'X - X = 0' means zero to most of us but it means something different to an accountant. Do you consider reciprocal favour as free? For one has already paid his favour in the first place. **Quality is more than free.** ***Quality is certainly a plus!***

"Almost everything that actually gets done is accomplished by an individual rather than a system." said Crosby (1996b) recalling his days as quality engineer. He argues that an organisation can provide the information and the environment but making something happen is the responsibility of an

individual. From this, he defines quality management as *deliberately creating an organisational and personal* ***culture*** *where all transactions are accomplished correctly, on time; and where relationships with employees, suppliers, and customers are always successful.*

2.4 FEIGENBAUM

Originated the concept of **total quality control** (TQC), Dr. Armand V. Feigenbaum (1986, pp.7) defines quality as customer determined and measured against his/her requirements; total quality as an *excellence-driven* rather than a defect-driven concept, and, TQC as the control of that *total customer-satisfaction*-oriented concept of "***quality***."

In his view, quality is defined by the customer; and in this regard he is similar to Juran. He also feels that the quality philosophy extends beyond the factory floor to include all of the functions in an organisation. This is similar to Crosby's view of a broader scope for TQM. Brocka and Brocka (1992) assembled Feigenbaum's ideas as Three Steps to Quality, The Four Deadly Sins and his Nineteen Steps to Quality Improvement as described below. (see also Field, 1996, pp.43-48)

2.4.1 Feigenbaum's Three Steps to Quality

Below are the Feigenbaum's Three Steps to Quality:

1. Quality Leadership (*should be thoroughly planned and specific, constantly monitored and improved by management*).
2. Modern Quality Technology (*should be used by everyone to achieve error-free performances*).
3. Organisational Commitment (*to training to meet present needs and incorporate quality as part of the strategic planning process*).

2.4.2 Feigenbaum's Four Deadly Sins

Feigenbaum summarises the often-encountered excuses in the Four Deadly Sins as follows:

1. *Hothouse Quality* (stick to what is given, lacking the sense or initiative to search for problems and for improvements).
2. *Wishful Thinking* (naive and does not help solving problems).
3. *Producing Overseas* (though it is not your fault, it does affect your own product qualities).
4. *Confining Quality to the Factory* (does get you nowhere).

2.4.3 Feigenbaum's Nineteen Steps to Quality Improvement

The Feigenbaum's Nineteen Steps to Quality Improvement are listed below:

1. **Total Quality Defined** (*management commitment for integrating quality development, quality maintenance, and quality improvement efforts of various groups in an organisation so as to enable marketing, engineering, production, and service at the most economical levels which allow for full-customer satisfaction*).
2. **Quality Versus Quality** (*quality standards must be continuously compared, maintained and improved*).
3. **Control** (*setting quality standards, appraising conformance to the standards, taking corrective action when the standards are not met, planning for improvements in both processes and standards*).
4. **Integration** (*with all facets of the organisation to achieve the ultimate aim of excellence-driven full-customer satisfaction*).
5. **Quality Increases Profit** (*with TQC, customer satisfaction improves, losses reduce and costs decrease thus both short- and long-term profits increase*). (see also my comment on page 32)

6. **Quality Is Expected, Not Desired** (*quality must be expected in each and every process down from supplier to customer*).
7. **Humans Impact Quality** (*only humans will appreciate and demand for quality and quality improvements, not machines*).
8. **TQM Applies to All Products and Services** (*qualities must be maintained and improved throughout, whether they be products, processes or services*).
9. **Quality is a Total Life-Cycle Consideration** (*quality is expected throughout the life of the product from raw material, manufacture, delivery, installation and service*).
10. **Controlling the Process** (*including new design control, incoming material control, product control and special process control*).
11. **A Total Quality System may be Defined as** (*agreed company- and plant-wide operating work structure, documented in effective, integrated technical and managerial procedures, for guiding co-ordinated actions of people, machines, and information of the company and plant in the best and most practical ways to assure full-customer satisfaction and economical costs of quality with continuous control of all key activities*).
12. **Benefits** (*increased customer satisfaction, reduced costs, losses and production bottlenecks, and enhanced team morale*).
13. **Cost of Quality** (*including prevention costs, appraisal costs, internal and external failure costs*).
14. **Organise for Quality Control** (*planned and conducted at each work station, checked and used by those concerned*).
15. **Quality Facilitators, Not Quality Cops** (*through communicating, training and support to enhance quality; but not for inspections*).
16. **Continuous Commitment** (*a never-ending process*).

17. **Use Statistical Tools** (*an essential part of TQC to substantiate problems, to substantiate controls and to measure improvements*).
18. **Automation is not a Panacea** (*focus on achieving excellence through human endeavour before resolving to automation which produces things — defective or nondefective — at high rates*).
19. **Control Quality at the Source** (*before it deteriorates down the stream, causing more damage*).

Feigenbaum's ideas include elements of the ideas described by Deming, Juran and Crosby. He advocates constructing a total system to manage the entire value-chain connecting supplier to customer; urges the involvement of all employees and, more importantly, that quality be part of the employee culture as an ethic that supports constant improvement of performance. Like the other gurus, he feels that top management should be the driver but, unlike others, he explicitly defined a role for the quality control staff as facilitators. The methods he developed were based primarily on statistics. And while he advocated a customer focus and the total participation of employees, he did not develop specific approaches to achieving these goals (Rao et al., 1996, pp.45,48).

"In the complex international economy we live in, it takes years for major trends to assert themselves — total quality became an '**overnight**' success after many years of being ready for it." said Feigenbaum (1996) advocating the needs for **Total Quality Leadership™** (TQL). The reason for TQL to be the new requirement for success is that it focuses on quality that is:

- Consistently affordable for today's increasingly economically constrained consumers and business buyers...
- Essentially perfect for him and her...

- Determined by the user. (*The cost of failure in delivering this complete customer satisfaction in progressively reduced through individual and group improvement efforts. These both fund quality values enhancement as well as provide major additions to net operating income itself.*)

And these are attributable to the following two rapid and vast changes:

* The rapidly expanding customer satisfaction demands for much greater purchase value from today's very savvy customer as well as buyer...

* The growing cost pressure forced by the rapidly increasing cost and quality efficiency in the many new Japan's — not only in Asia but also other parts of the world — that both US companies and the Japanese themselves will face.

The third change he urges is to reject the *false management doctrine* — that good management and successful improvement means getting the ideas out of the boss's head into the hands of the workers, implementing this doctrine has been characterised by the kind of inward looking restructuring which looks at the corporate navel while too often growing out of touch with rapid changes in new markets, new employee attitudes and new management approaches — and to implement TQL with the following important aspects as fingerprints:

⇒ Senior management's ability to lead the quality effort.

⇒ Senior management's ability to focus on firm improvement goals.

⇒ Senior management's ability to create and support an empowering atmosphere.

⇒ Senior management's ability and self-discipline to completely satisfy the customer.

⇒ Senior management's ability to relentlessly strengthen individual and group leadership capacity.

When these five fingerprints of action are taken together and quantified in a competitive trend database, the data indicates that the effectiveness of customer quality delivery systems is three to four times greater than that of competitors (Feigenbaum, 1996).

2.5 ISHIKAWA

Dr. Kaoru Ishikawa was one of the foremost TQC leaders in Japan. As a professor of engineering, he discovered the importance of statistical methods and became closely connected with the promotion of QC in 1949. In the early 1950s, Ishikawa (1985, pp.5) was engaged in the training programmes for shop foremen called "workshop QC study groups" which were renamed "QC circle" activities by the editorial board of FQC (the journal of *Quality Control for the Foreman*) in 1962. Since that time these activities have spread very rapidly to secondary and tertiary industries; not only in Japan but the world over.

Ishikawa (1985, pp.44-45) contends that "*to practice QC is to develop, design, produce and service a quality product which is most economical, most useful, and always satisfactory to the customer,*" with a number of pointers in its implementation as follows:

1. QC is engaged in order to manufacture products with the quality which can **satisfy the requirements of customers**.
2. **Customer orientation** must be emphasized (*opinions and requirements of customers should be taken into account when design, produce, and sell products*).

3. **Quality** is interpreted in its broader sense (*to include quality of work, quality of service, quality of information, quality of process, quality of people including workers, engineers, managers and executives, quality of system, quality of company, quality of objectives, etc.*).
4. **Price**, **Profit** and **Cost** control must be considered in total when defining quality (*strive to supply a product with just quality and just price*).

In essence, to engage in quality control means to

- use control of quality as the basis;
- engage in integrated control of cost, price, and profit;
- control quantity (amount of production, of sales, and in stock) and date of delivery.

He believed that all divisions and all employees in the organisation should be involved in studying and promoting QC by learning seven statistical tools (see also Kanji and Asher, 1996) of which he created one of the tools, the cause-and-effect diagram, which was named the Ishikawa (1985, pp.64) Diagram by Juran (1962). The seven statistical tools that Ishikawa encouraged everyone to learn are:

1. **Pareto Diagram** (*to identify/prioritise major problems*).
2. **Cause and Effect Diagram** (*to identify/clarify causes of variations*).
3. **Stratification** (*to partition variations into homogeneous sets*).
4. **Check Sheet** (*to collect data for analysis*).
5. **Histogram** (*to display the overall variations*).
6. **Scatter Diagram** (*to display relationships between factors*).
7. **Graph and Control Chart** (*to display the abilities of controlling variations*). (Ishikawa, 1985, pp.198; Dahlgaard et al., 1990)

2.6 TAGUCHI

To compete effectively in today's marketplace, companies must find ways to improve the quality of their products while lowering the cost of production. They must also bring products to market quicker and with minimal research and development costs. Although there are many tools available for increasing productivity and solving problems, Dr. Genichi Taguchi developed a set of techniques based on statistical principles and utilising engineering knowledge. By associating quality with the financial loss imparted by poor quality, he developed a methodology that makes quality decisions based on cost effectiveness (Peace, 1993, pp.1-2).

In developing methods to better understand the influences upon the functionality of products and associated processes, Taguchi particularly recognized three major contributions to the field of quality: **the loss function, orthogonal arrays** and **linear graphs**, and **robustness**.

2.6.1 The Loss Function

Source: Peace (1993, pp.3)

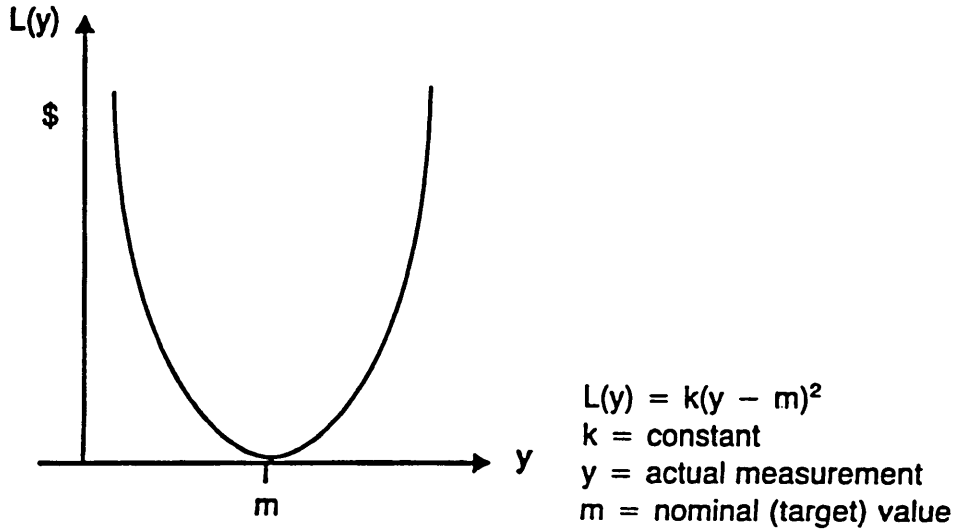

Figure 3: *Taguchi's Quadratic Loss Function*

The first major contribution of Taguchi was the *loss function* which directly linked quality and corporate profitability. Using the Taylor Expansion Series, he developed a mathematical model in which loss is a quadratic function of the deviation of the quality of interest from its target value (see figure 3 below). Based on this concept, sound management decisions can be made as to the true worth of quality improvement efforts. Decisions can be made based not on rhetoric/emotions, but on facts pulled from data (Peace, 1993, pp.4).

2.6.2 Orthogonal Arrays and Linear Graphs

The second major contribution of Taguchi was the use of the *linear graph* which is a graphical representation of orthogonal array, developed by R. A. Fisher, for assigning factors under investigation and corresponding interactions among these factors. By using these specially designed graphs, the experimenter can effectively study interactions between experimental factors as well as the effects of individual factors (main effects) themselves. This is possible because the linear graphs provide a logical scheme for assigning interactions to the orthogonal array without confounding the effects of the interactions with the effects of individual factors being studied.

Using *engineering knowledge* and *experience*, **Dr. Taguchi** incorporated into experiment those *interactions that have the most likely chance of having a strong effect on the product and/or process*. The end result is that the experimental design matrix remains highly efficient and cost effective while the conclusions are consistently reproducible. (Peace, 1993, pp.4-5)

2.6.3 Robustness

The third major contribution is the concept of *robustness* which is defined from both a product- and a process-related stand-point as follows:

Product: The ability of the product to perform consistently as designed with minimal effect from changes in uncontrollable operating influences.

Process: The ability of the process to produce a consistently good product with minimal effect from changes in uncontrollable manufacturing influences.

These robust definitions of product and process require thorough considerations right from the product design, the process design and the sourcing of material down to the packaging and the distribution and the after-sale service. Taguchi's strategy is to control those significant factors that are feasible and practical to control, in such a way that the effect of uncontrollable factors is minimised. (Peace, 1993, pp.5-6).

Liu (1982, pp.1) studied the robustness of power in the Analysis of Variance for various designs. He gave an account on the robustness of power in the analysis of variance for various experimental designs when the assumptions are not met and traced back the history of the study of robustness to 1888, though the idea was germinated by R. A. Fisher in 1935, in his book: '*The Design of Experiment*,' where he raises, for the first time, the concept of robustness in terms of the sensitivity of the 't' test to the underlying assumption of normality. It was G. E. P. Box who actually introduced the term '**Robust**,' in 1953, to denote a statistical procedure which is insensitive to departures from

assumptions on which the model is based. This, perhaps, may help readers to understand better the meaning of robustness.

2.7 KANJI

Kanji (1990) defines Quality, Total Quality and TQM as follows:

⇒ **Quality** — is to satisfy customer's requirements continually.

⇒ **Total Quality** — is to achieve *quality* at low cost.

⇒ **Total Quality Management** — is to obtain *total quality* by involving everyone's daily commitment.

He advocates that **quality is a continuous process**, not a quick fix, that can be broken anywhere in the system of supply and customer service. He further incorporates the Deming Cycle in the customer-supplier chain to give the *supplier/customer — continuous improvement interface* that becomes one of his Eight Core Concepts — the internal customer is real. (Kanji and Asher, 1993)

Kanji (1994) conceptualises his quality thinking into **Five Governing Principles** and **Eight Core Concepts** and ties them together to form the **Quality Pyramid** (see figure 4, on page 45).

2.7.1 The Five Principles and The Eight Core Concepts

The Five Governing Principles, four of which have two core concepts to give the Eight Core Concepts, are listed below:

1. **Delight the Customer**
   - *1.1 Customer satisfaction*
   - *1.2 Internal customers are real*
2. **Management by Fact**

2.1 All work is a process

2.2 Measurement

3. People-Based Management

3.1 Teamwork

3.2 People make quality

4. Continuous Improvement

4.1 Continuous improvement cycle

4.2 Prevention

5. Leadership

The fifth principle *Leadership* (see figure 4 below) is the base upon which quality is built and geared to.

The US President Bill Clinton (1996) in the presentation of the **1995 Malcolm Baldrige Quality Awards** acknowledged the importance of teamwork:

> "The people who aren't here whose names we'll never know are just as important as the people who are here in the fact that these two companies won these awards today."

2.7.2 The Kanji/Asher's Quality Pyramid

Kanji and Asher (1993) and Kanji (1994) summarise their quality principles and core concepts in the form of a pyramid below:

Source: Kanji (1994); Field (1996, pp.59)

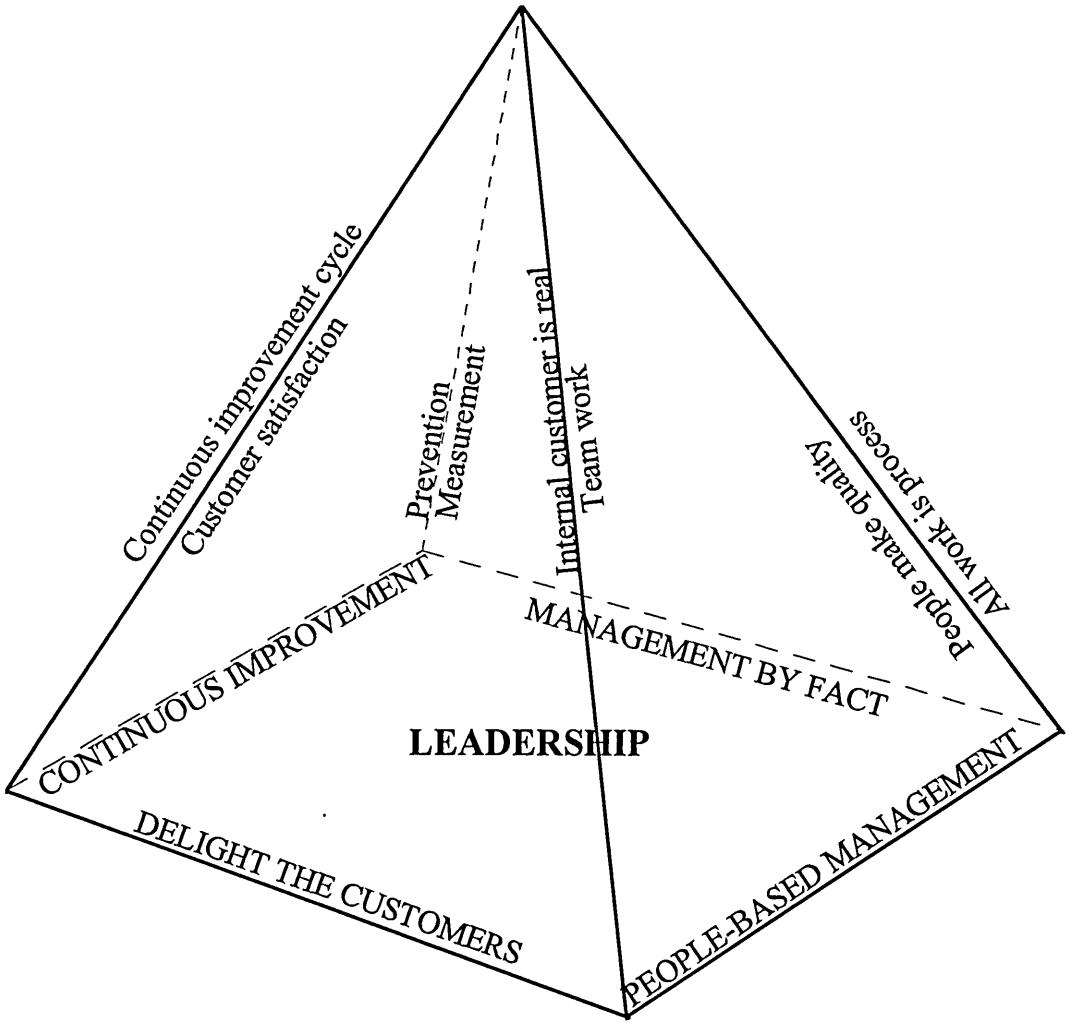

Figure 4: *The Kanji/Asher's Quality Pyramid*

This Quality Pyramid traces back the manner in which people have searched for quality and excellence from the time of the Pharaohs.

2.7.3 Further Look On The Quality Pyramid

Sometimes those who are not familiar with solid geometry may find it difficult to comprehend the message conveyed in Kanji/ Asher's Quality Pyramid. Figure 5 below provides an opened view of the Quality Pyramid.

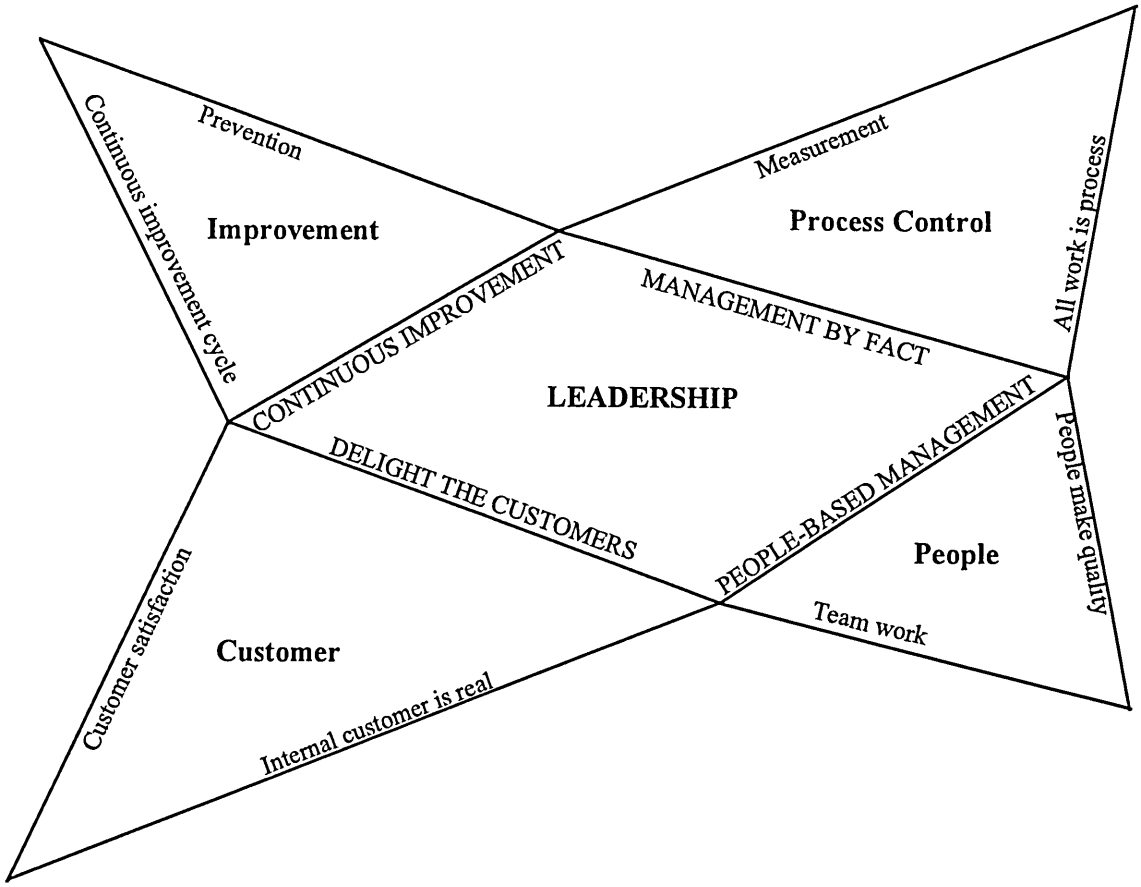

Figure 5: *An Opened View of Kanji/Asher's Quality Pyramid*

It is revealed that the message of the Quality Pyramid is:

"PROCESS CONTROL *is used by* **PEOPLE** *to monitor* **IMPROVEMENT** *to meet* **CUSTOMER** *satisfaction directed by* **LEADERSHIP."**

A cultural model of TQM, based on Kanji's (1994) Five Governing Principles and Eight Core Concepts as well as the Kanji/Asher's Quality Pyramid, is developed in the following chapter.

3. MODEL DEVELOPMENT

M.M.L.Wong (1995) gives a very good example of why sometimes implementing TQM does not induce the desired outcomes (see page 15). Lo and Tong (1995) realise that the key to success lies profoundly in company culture (see page 16). Tang and Maule (1995) described the experience of the MTRC in achieving a total customer service culture on their road to winning the Award for Excellence in Training (see page 16). Feigenbaum (1996) attributes the reason for TQL to be the new requirement for success to two rapid and vast changes (see page 36) in customer culture. All of these have something in common, namely, "**CULTURE**"; whether it be company culture or customer culture.

Scrimshire and Wootton (1995) comment that the introduction of TQM involves a cultural change, i.e. a change in management style and change in the way both people and systems operate. If properly implemented, it will assure optimum effectiveness overall, and within every functional department. All activities will be aligned with the organisation's prime goals as expressed in the Mission Statement and Strategic Objectives. Customers' needs and expectations will always be met without any form of **waste** by using the full potential of everybody involved.

Nave et al (1995) propose a theoretical quality improvement model which stems from a system approach and needs to be implemented on the individual, team, and organisational level; be implemented in a field-setting; and be tested for effectiveness in a longitudinal study which documents, measures, and evaluates the process and outcomes. The **3D-model of quality improvement** proposed consists of three propositions:

1. Quality improvement is a process of continuous change of individuals, teams, and organisations. (*This change occurs when employees learn by having dialogue with others.)*

2. The change of mind-set and behaviour is caused by three sources:
   a) **Cognitive factors** — information, feedback, and skills acquisition.
   b) **Motivational factors** — vision and goals, intrinsic and extrinsic rewards for effective attitudes and behaviour.
   c) **Socio-dynamic factors** — group interactions, management support and involvement.

3. The behavioural change towards quality improvement is accompanied by a change of attitudes, values, and commitment. (*Therefore, continuous change in performance quality must be supported by a change in the organisational culture.)*

Their findings demonstrate a significant change in all measures — cost of quality decreased from 22 to 2 percent, inventory cost decreased by 11 percent, savings, as a result of the suggestions system, were four times higher at the end of data collection than before, accident rate decreased by 62 percent, and a significant change in organisational culture: emphasis on quality, innovation, attention to details, team orientation and supportiveness increased significantly, attitudes significantly changed towards higher levels of commitment and work satisfaction, change towards a quality-oriented culture highly correlated with the improvement in performance.

Wilton and Reavill (1995) note that organisations may adopt protocols such as BS/EN/ISO 9000 in order to obtain accreditation to enhance customer credibility. Only by embracing and harnessing both a sympathetic culture and an appropriate protocol together in their entirety will any TQM programme truly succeed on an ongoing basis.

Dobson (1996) highlights the strategy and training process devised and implemented to produce multi-skilled personnel, working successfully in self-managed teams and the associated key development of working team leaders to exploit capabilities of the new technology in the roll preparation area. Using both in-house and external modules, with continuous assessment, review and modification at each stage, the 3 hour roll build up has been achieved. He reports that significantly more time has been devoted to this project than first envisaged. It has meant a big commitment by all levels of personnel but the reward is the satisfaction of seeing real change develop. It is important that individuals in a team are given the opportunity to discuss their problems and reach consensus. Experience has shown that initial leadership by management is necessary to set the framework and provide encouragement. This is then overtaken by enthusiasm within the team itself, thus triggering the change in culture.

Hogg (1996) gives an account on how a heavy section mill of the British Steel under threat of closure in the late 1980's becomes a leading global producer of steel sheet piling products in 1996. He comments that this turnaround was only possible by changing the culture of the employees from one of despondency at the thought of closure to one of commitment to the mill's future in the 21st century.

Before defining ***culture***, let us look at some of the *factors* that most definitions of the term have in common:

- *Culture* is a social construction: the elements of culture, such as values, beliefs, and understanding, are held in common by all group members.
- *Culture* provides members with a way of making sense of events.
- *Culture* contains customs or traditions.

- Within a *culture*, patterns of values, beliefs, expectations, understanding, and behaviours emerge and evolve over time.
- *Culture* guides behaviour: customs or traditions are the glue that holds an organisation together and ensure that members behave according to collective norms.
- Each organisation's *culture* is unique.

Source: Bounds et al (1994, pp.102) based on Schein (1985) and Ott (1989)

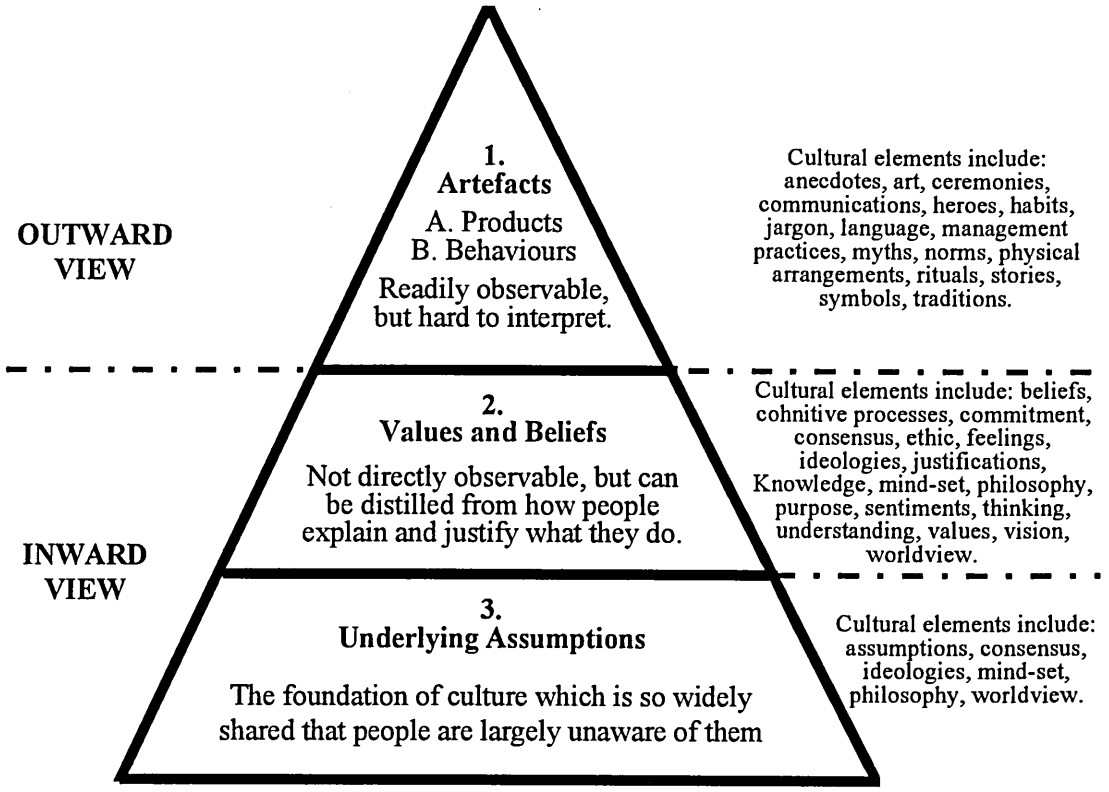

Figure 6: *Three Levels of Organisational Culture and Elements that Reflect Each Level*

Building on these common factors, Bounds et al (1994, pp.101.) define ***culture*** as *a pattern of artefacts, behaviours, values, beliefs, and assumptions that a group develops as it learns to cope with internal and external problems of survival and prosperity.* This definition encompasses

both the outward and inward views (see figure 6 above). Each view reveals something important about an organisation's culture.

Culture emerges in organisations because of the organisation's need to deal with the external and internal problems of survival and prosperity. As organisation's survival and prosperity depend on its ability to effectively interact with its environment and achieve *external adaptation* which includes:

1. a sense of mission or purpose,
2. goals for fulfilling the mission,
3. means for accomplishing the goals,
4. measurements to assess how well they are doing,
5. procedures for making corrections and changing courses of action to fulfill the mission and goals (Schein, 1985),

and *internal integration*, the cohesion of a group to work together to fulfill the group's mission, by developing cultural solutions to address:

1. a common language;
2. specific group boundaries (criteria for inclusion and exclusion);
3. power and status;
4. intimacy, friendship, and love;
5. rewards and punishments;
6. ideology and religion. (Schein, 1985)

As consensus develops on these issues, the group derives learned solutions for achieving internal integration that become a part of the organisation's culture. Good internal integration permits the development of cultural

solutions that facilitate external adaptation. Having cultural solutions for internal integration allows people to interact and behave comfortably. Members know the rules of the game and can predict and understand what is going on. (Bounds et al, 1994, pp. 112-113.)

Culture can be described as a set of shared perceptions of "how people think and behave round here". The shared perceptions which make up culture are based on messages continually being communicated to members of the organisation. A wide range of explicit and implicit organisational signals provides these messages — stories, rituals, explicit statements, physical symbols, rewards and attention. It is often the implicit and ambient messages that are pervasive, and hence most powerful, in determining organisational culture. And organisational culture profoundly influences corporate policies, plans, programmes and managerial behaviour. These in themselves send out messages which are further interpreted and evaluated by staff as part of a cycle of feedback loops. This cultural process strongly influences all individual behaviours, and results ultimately in outcome variables such as productivity and quality. (Rouse and Watson, 1995)

Indeed, *quality culture and TQM* have been studied by Hildebrandt et al (1991). They use the **O-V-P-A culture cycle** (see figure 7 below) to explain the changes in quality culture and corporate culture taken place during the implementation and pursuit of TQM.

Source: Hildebrandt et al (1991)

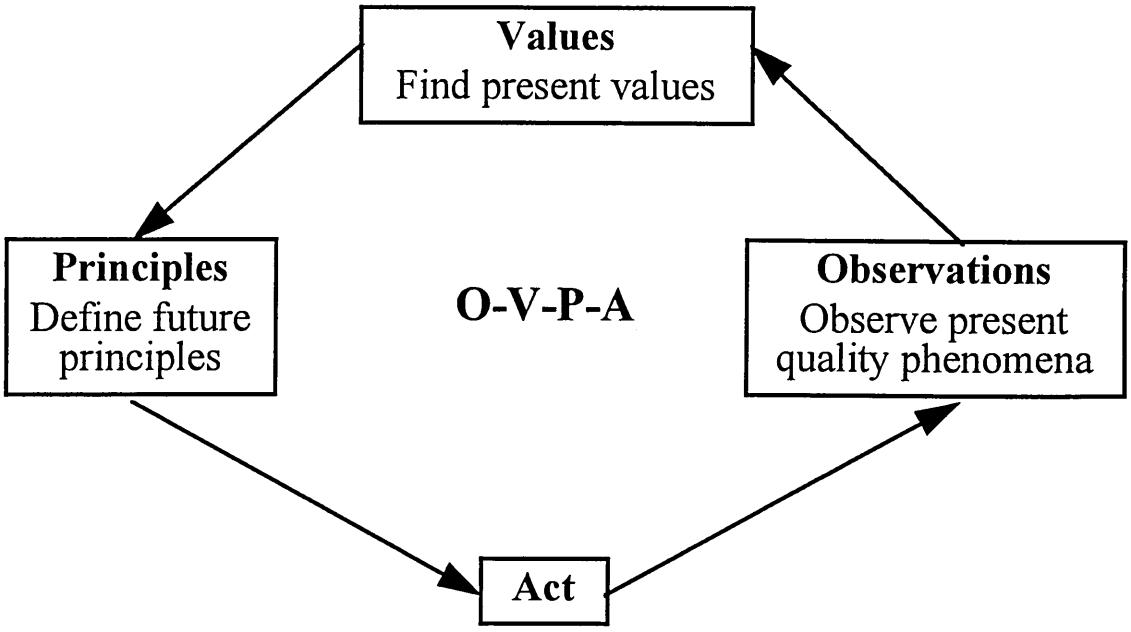

Figure 7: *The Culture Cycle*

Hildebrandt et al (1991) further superimpose the culture cycle on the Deming Cycle to create an expanded Deming Cycle (see figure 8 below) with the two connected in the action field. The Deming Cycle is still the basic work method. From this, a new cultural framework concerning quality emerges, and the company is once again ready to use the P-D-C-A-cycle but on a new level.

In order to make a total TQM cycle, Hildebrandt et al's (1991) model has to be expanded in the same way as Kondo (1977) did with the traditional Deming Cycle. While his model works at the operational level, the model to be proposed in section 3.2 will work at the conceptual level.

Source: Hildebrandt et al (1991)

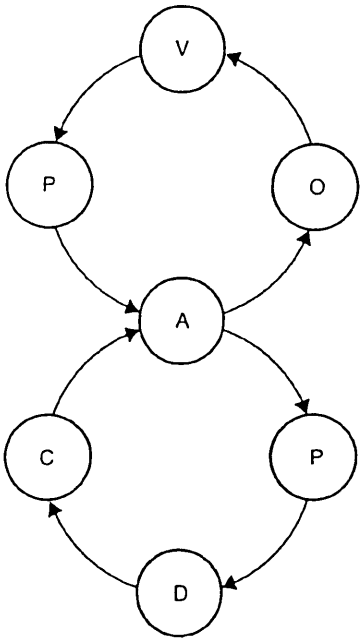

Figure 8: *The Expanded Deming Cycle*

3.1 SELECTION OF REPRESENTATIVE MODEL OF TQM

In order to choose, objectively, a representative model on which to develop the CULTURAL MODEL of TQM, a spectrum of eight TQM dimensions is considered as basis of comparison and they are *leadership*, *people management*, *policy and strategy*, *resources*, *processes*, *people satisfaction*, *customer satisfaction* and *business results*. These eight TQM dimensions are used for quality appraisal of the individual organisation, for example, in the European Quality Award (Kanji, 1996).

For each TQM Guru, the number of principles advocated which fall into each of the eight TQM dimensions are counted. A table comparing the seven TQM Gurus' principles with a spectrum of eight TQM dimensions is given in table 1 and selection criterion is based on the composite indicator α_i defined below.

Source: Field (1996, pp.67)

SPECTRUM OF TQM DIMENSIONS

TQM GURUS	NUMBER OF PRINCIPLES n_i	1. LEADERSHIP	2. PEOPLE MANAGEMENT	3. POLICY AND STRATEGY	4. RESOURCES	5. PROCESSES	6. PEOPLE SATISFACTION	7. CUSTOMER SATISFACTION	8. BUSINESS RESULTS	TOTALS	COMPOSITE INDICATOR α_i
1. DEMING	14	14	13	10	9	14	11	6		77	52.94
2. CROSBY	14	14	14	2	13	13	10	2		68	41.29
3. FEIGENBAUM	19	19	17	9	8	16	13	7	3	92	55.68
4. ISHIKAWA	11	11	11	6	5	11	0	3	1	48	26.18
5. JURAN	10	10	10	5	9	10	9	5		58	42.05
6. KANJI & ASHER	13	13	13	9	11	13	13	9	1	82	64.65
7. TAGUCHI	7	7	7	4	7	7	7	5	1	45	36.16

Table 1: *Comparison of TQM Gurus' Principles Across the Spectrum of TQM Dimensions*

The composite indicator α_i is defined as

$$\alpha_i = \beta_i \times \delta_i$$

where α_i is a product measure of both the degree of representation and the degree of applicability for the i^{th} TQM guru;

$\beta_i = \sum_j \mathbf{X_{ij}}/\mathbf{n_i}$ is the average number of principles of the i^{th} TQM guru that can be applied across the spectrum of eight TQM dimensions considered which is a measure of the degree of general representation of the i^{th} TQM guru in the TQM spectrum;

$\delta_i = \sum_j \mathbf{X_{ij}}/\mathbf{m}$ is the average number of principles of the i^{th} TQM guru being applied per TQM dimension considered which is a measure of the overall degree of applicability of the principles advocated by the i^{th} TQM guru;

$\mathbf{m} = 8$ is the number of TQM dimensions under consideration;

$\mathbf{n_i}$ is the number of principles advocated by the i^{th} TQM guru, and;

$\mathbf{X_{ij}}$ is the number of principles of the i^{th} TQM guru that can be applied in the j^{th} TQM dimension.

It is clear that the TQM principles advocated by Kanji scored the highest value of α_i (α_6 =64.65) and the Kanji/Asher's Quality Pyramid is chosen as the basis on which the Cultural Model is developed in the next section.

3.2 THE CULTURAL MODEL OF TQM

Realising the impact and importance of culture on TQM, the cultural dimension, a new concept by Hildebrandt et al (1991), is incorporated in the form of a sphere circumscribing Kanji/Asher's quality pyramid selected above to give the proposed cultural model of TQM as in figure 9 below.

In this model, Kanji (1994)'s Five Governing Principles and Eight Core Concepts are used to shape the quality culture of the company, and this company culture will, in turn, help shape the quality consciousness of individuals and the quality culture of the customer. Changing culture

requires determination, perseverance and role-modelling for the leader (Lo and Tong, 1995). Getting across the quality message is never easy, especially when people think they already know (Moullin, 1995). **And there is no quick fix!** (Kanji and Asher, 1993, pp.1)

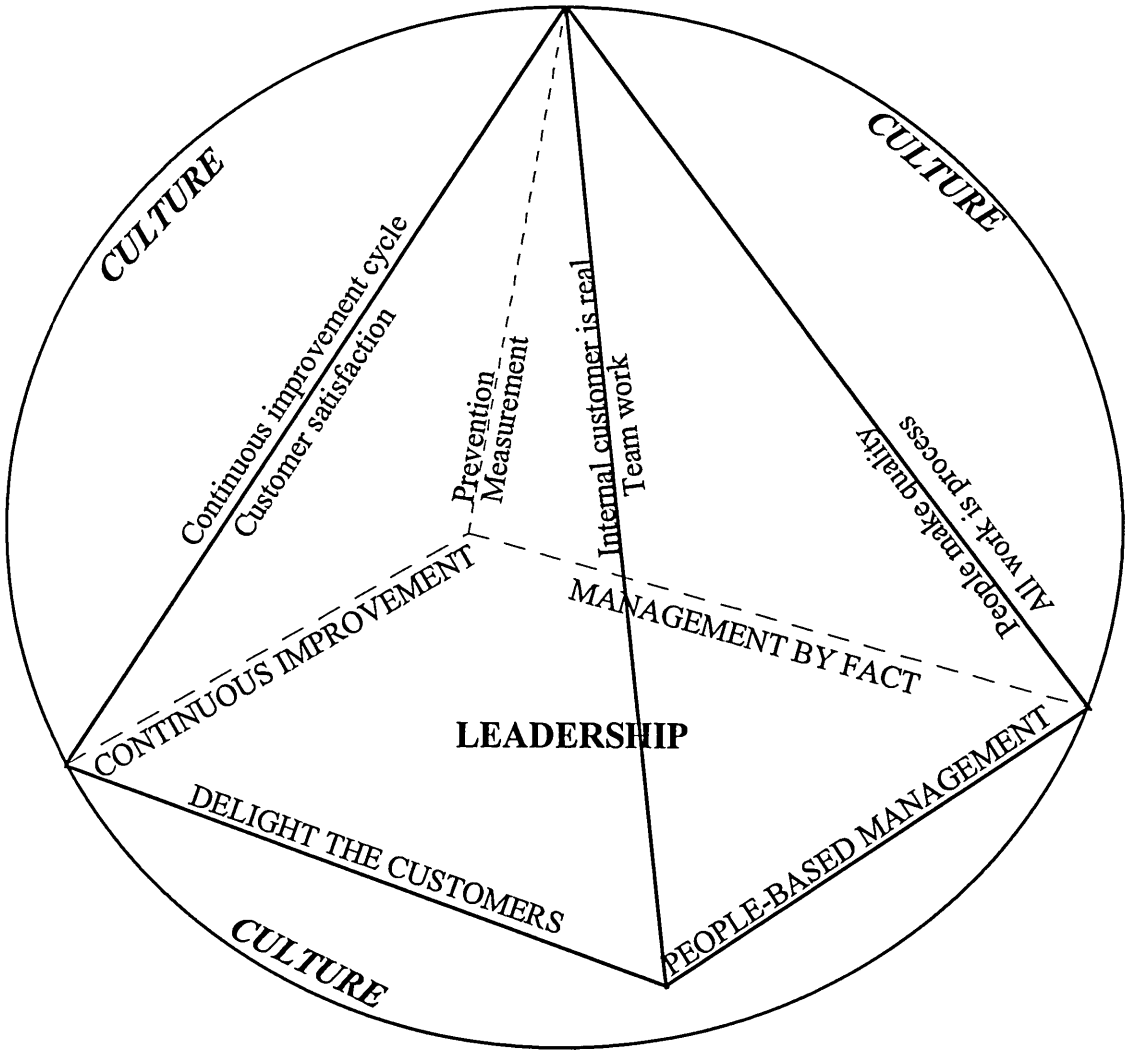

Figure 9: *The Cultural Model of TQM*

Like in the opened view of Kanji/Asher's Quality Pyramid (see page 45), the message of this cultural model of TQM is:

"**PROCESS CONTROL** *is used by* **PEOPLE** *to monitor* **IMPROVEMENT** *to meet* **CUSTOMER** *satisfaction directed by* **LEADERSHIP** *to shape the quality* **CULTURE** *of the company.*"

To re-iterate, this company culture will, in turn, help shape the quality consciousness of individuals and the quality culture of the customer.

Based on the Cultural Model of TQM developed above, an instrument is developed to see if the model can be used to describe the total quality management approach for the Hong Kong Industries in the next chapter.

4. METHODOLOGY

The *Manufacturing Industry* has been chosen for the current study for the following two reasons:

i. it is the major earner of foreign exchange for Hong Kong, and;

ii. it is the industry from which QC techniques, QCC, TQC, CWQC and TQM are all originated.

Survey is the appropriate method to collect the necessary data for the study because Hong Kong has a cheap and efficient postal service as well as a cheap and effective telephone system to support an impressive successful and fast moving business community. Additionally, it was envisaged that the CEOs of the target companies would see to the proper completion and return of the questionnaire without having to themselves complete it. Details of questionnaire design, sampling design and method of analysis are described below.

4.1 QUESTIONNAIRE DESIGN

The questionnaire was designed so as to collect information on the principle, practice and approach to TQM in the manufacturing industries of Hong Kong in general with the Six Governing Principles and Eight Core Concepts imbedded (see table 2 below).

A Chinese/English bilingual questionnaire (see Appendix I) was employed to avoid any errors in translation or misinterpretations since Hong Kong's population is largely comprised of the Chinese race coming from a variety of origins — local, immigrant, expatriate and repatriate Chinese —

and expatriates from other countries. The chief executives of the target companies all read either Chinese or English. The usage of Chinese is different in Taiwan, on the Mainland, and in Hong Kong and delicate comments on the Chinese version of the questionnaire were received and acknowledged.

TQM Principle	Core Concept	Question Number
Delight the Customer	Customer Satisfaction	37,38,41,42,43
	Internal Customer is Real	25,36,39
Management by Fact	Measurement	7,8,9,23,32,40,44,50, 51,56
	All Work is Process	19,20,46,47
People-Based Management	Teamwork	27,28,53
	People make Quality	10,11,15,24,31,33
Continuous Improvement	Continuous Improvement Cycle	14,26,29,30,34,48,49
	Prevention	12,13,16,52,54,55
Leadership	(Vision/Direction)	6,17,18,21,22,35,45, 57

Table 2: *Description of Questionnaire Layout in terms of TQM Principles and Core Concepts*

4.2 SAMPLING DESIGN

There are two major manufacturers' associations in Hong Kong from which the sampling frame can be chosen:

i. The Chinese Manufacturers' Association of Hong Kong (CMA) — a non-profit making chamber of commerce and industry,

established in 1934, with over 3600 members from various sectors of industry and trade.

ii. The Federation of Hong Kong Industries (FHKI) — an independent statutory organisation established by the Government in 1960 under the FHKI Ordinance, Chapter 321 of the Laws of Hong Kong.

Because of its background and support offered, it was decided that the sampling frame be based on all members of the FHKI involved in manufacturing.

The cheap and efficient postal service of Hong Kong, as well as the low printing cost, made it possible to survey, with self-administered questionnaire and pre-paid reply envelope supplied, all members of the FHKI involved in manufacturing by mail. This task was made easier with the FHKI's support to stick on the address labels and distribute them to its members involved in manufacturing.

Sampling procedures for any follow-up survey had the responses been low were as follows:

1. generate a 3-digit random number using the random number function of a calculator or computer;
2. look up the page in the FHKI Members' Directory 1994 according to the number generated in (1);
3. discard any members already replied on that page;
4. the responsible person of each of the remaining company members is contacted by telephone in turn;

5. if the responsible person agreed to consider participation in the survey, send him/her the questionnaire;
6. repeat (1) to (5) until the remaining questionnaires are all despatched;
7. remind those not replied one month from the date of despatch.

4.3 METHOD OF ANALYSIS

The usual methods of display like frequency tables and bar charts are used to report the responses in the preliminary findings. Techniques pertaining to testing of hypotheses and the abstraction of information are described below.

4.3.1 Contingency Table

The Chi-square test for contingency table is employed to test the null hypothesis

H_0: The two characteristics are independent

against the alternative hypothesis

H_1: The two characteristics are not independent

(i.e. there exists some kind of relationships)

in an r×k cross classification with (r-1)(k-1) degrees of freedom (see Kanji, 1993, pp.13; Norušis, 1993, pp.206-226). The only requirement is that the expected cell frequencies should not fall below 5, or re-grouping is necessary otherwise. To improve the approximation for a 2×2 contingency table, **Yates' correction for continuity** is sometimes applied (see Norušis, 1993, pp.209).

In circumstances where the only requirement for a 2×2 contingency table is not met, the **Fisher's exact probability test** can be applied (see Kanji, 1993, pp.71; Norušis, 1993, pp.209).

Whether to apply regrouping, Yates' correction, Fisher's exact probability test or not when the expected frequency of at least one cell fall below 5, will depend on the professional judgement as to whether or not such measures would reduce the overall chi-square, and on the effect due to the reduction in degrees of freedom, in the case of regrouping, on the sensitivity of the test itself.

Due to the low response rate, which implies that the average degrees of freedom per cell is low, the Chi-square test for contingency table, using CROSSTAB command for multiple responses under SPSS for Microsoft WINDOWS Release 6.0 to generate the frequency cross tabulations (with all the expected frequencies and all the cell chi-square contributions calculated manually), is restricted to variable(s) with multiple responses. Relationships to be examined are listed below:

1. questions 3 (sources of capital) and 8 (use of quality document) to see if the source of capital has any effects on the use of quality document;
2. questions 3 (sources of capital) and 22 (objectives communicated to employees) to see if the source of capital has any effects on the methods used to communicate objectives to employees;
3. questions 3 (sources of capital) and 31 (ways to ensure employees suggestions) to see if the source of capital has any effects on the ways employees make their suggestions;

4. questions 3 (sources of capital) and 33 (use of formal evaluation) to see if the source of capital has any effects on the use of formal evaluation;
5. questions 8 (use of quality document) and 10 (who define quality goals) to see if participation in defining quality goals has any effects on the use of quality document;
6. questions 8 (use of quality document) and 15 (participant in the audit) to see if participation in defining quality goals has any effects on the participation in the audit;
7. questions 8 (use of quality document) and 57 (desire for ISO 9000) to see if participation in defining quality goals has any effects on the desire for ISO 9000;
8. questions 10 (who define quality goals) and 15 (participant in the audit) to see if participation in defining quality goals has any effects on the participation in the audit.

4.3.2 Analysis of Variance

The technique of one-way analysis of variance (1-way ANOVA) (see Kanji, 1993, pp.46; Norušis, 1993, pp.267-280) is employed to test the null hypothesis

H_0: No differences among the group means

(i.e. no treatment effects)

against the alternative hypothesis

H_1: At least two groups are different in means

(i.e. at least two treatment effects are different).

The assumptions required of the data set are:

i. **independence**;

ii. **normality**, and;

iii. **homoskedasticity** (equal variances).

Within moderate departure of the assumptions, the power of the tests are not seriously affected. If in doubt, it is better to keep the group sizes equal (Liu, 1982, pp.59-60; Kanji and Liu, 1983).

In addition, the Kruskal-Wallis 1-way Analysis of variance, which is the non-parametric equivalent test for the 1-way Analysis of Variance, is also performed to safe guard the significant results found in the 1-way ANOVA had there been any violations in the assumptions.

If the null hypothesis of equal means was rejected, multiple pair-wise comparisons using the least significant difference method (LSD) (see Norušis, 1993, pp.278) are performed to further understand the nature of the heterogeneity of means.

The one-way analysis of variance technique, using 1-WAY ANOVA command under SPSS for Microsoft WINDOWS Release 6.0, is applied to analyse the responses of question 6 (see appendix I) to see if there is any differences in the importance amongst the competitive parameters considered by the companies internally.

4.3.3 Factor Analysis

Factor analysis is a statistical technique employed to identify a relatively small number of factors that can be used to represent relationships among sets of interrelated variables, i.e. to summarise or abstract information. The **varimax** method of rotating axes is used to minimise the number of variables that have high loading on a factor. This enhances the interpretability of the factors. (see Norušis, 1993, pp.53-94; Hair et al, 1995, pp.364-419).

The factor analysis, using FACTOR command under SPSS for Microsoft WINDOWS Release 6.0, is applied to abstract the information contained in the responses of question 6 (see Appendix I), along with the result from the 1-way ANOVA described in section 4.3.2, to further understand the underlying marketing strategies of the manufacturing companies in Hong Kong in general.

Survey findings from both preliminary and further analyses are presented in the next chapter.

5. RESULTS

A total of 1868 questionnaires were sent to all members of FHKI in the manufacturing industries toward the end of March, 1994. Only 48 completed or partially completed questionnaires were returned by the end of June, 1994, with another 5 companies replying that they were not in the manufacturing industries and were not able to participate in the survey. This gave a very low response rate of 2.58 percent. A follow-up sample survey of 150 members was then randomly selected, by the procedures described in section 4.2 (page 61), and despatched in early July, 1994. A further 4 completed or partially completed questionnaires were returned by the end of August, 1994, giving a final response rate of 2.79 percent. Response rates of similar magnitude were reported, 3 percent in Korea, by Dahlgaard et al (1990) and, 3 percent in Hong Kong, by Y.L.Wong (1995) for the part involving sample survey by mail.

Company profiles and responses to the questions are reported in the preliminary findings according to the Five Governing Principles and Eight Core Concepts in the way described in table 2 (page 60). Any relationships and things of interest found will be reported in further findings.

5.1 PRELIMINARY FINDINGS

Company profiles — like the types of industries, sources of capital, size of companies and places of manufacturing — of the respondents are reported here. Types of industries of the respondents include food and beverages; metals, electricals and electronics; toys; textile and garment; watch and jewellery, and; chemicals and pharmaceuticals. Industries like

printing; automobiles; paper bag and recycled paper stationeries; sewing machine; optics, and; plating machines are categorised under "Others". The respective frequencies are described in figure 10 below:

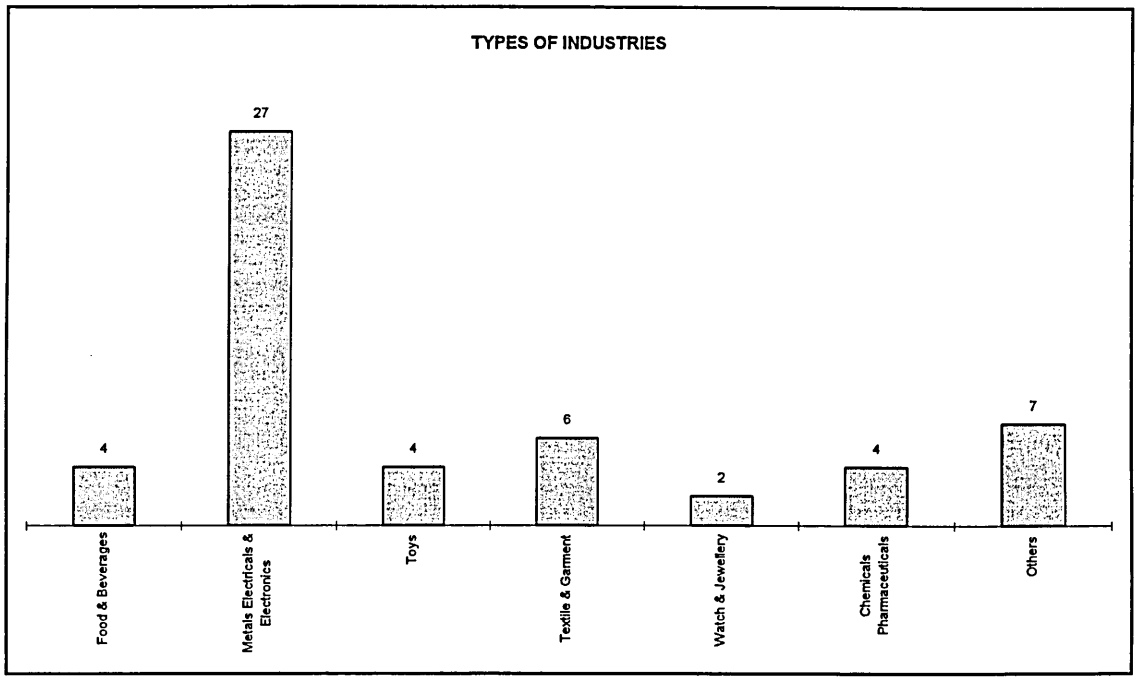

Figure 10: *Types of Industries*

It is found that, of the 52 responding companies, over 50 percent come from the metal, electrical and electronic industries; 11.5 percent from the textile and garment industries; 7.7 percent from the food and beverage industries; another 7.7 percent come from the chemical and pharmaceutical industries; and a further 7.7 percent from the toy industries. This gives a fair coverage of the manufacturing industries of Hong Kong.

The source of capital of the respondents include China, USA, Britain, Japan, Hong Kong, joint venture and others. Non-respondents are categorised as "N.R.". The respective frequencies are described in figure 11 below:

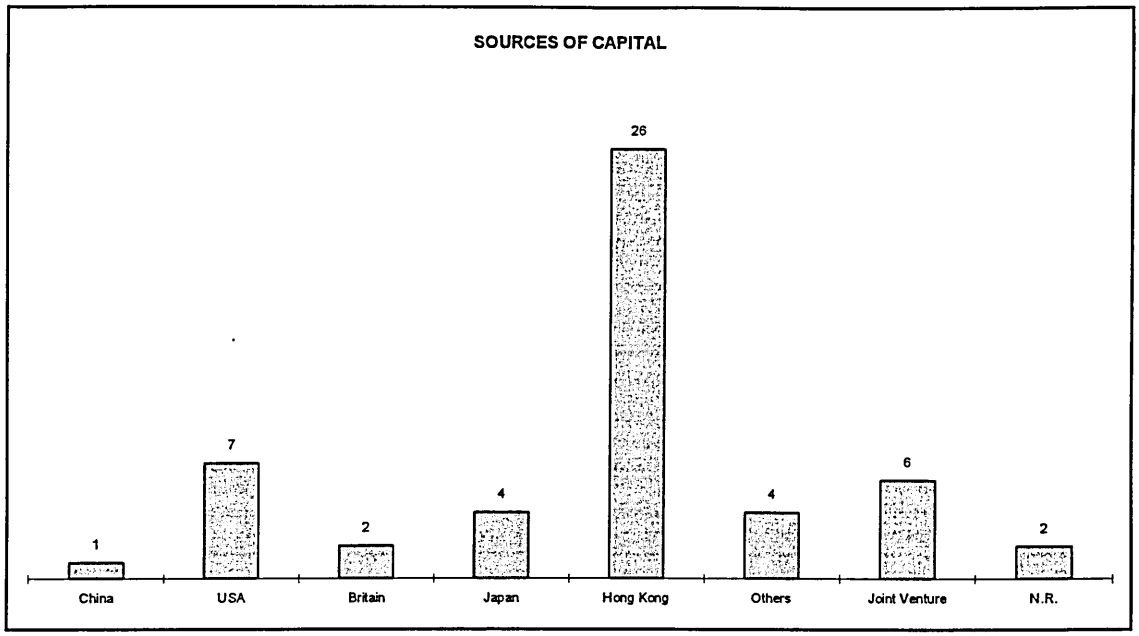

Figure 11: *Sources of Capital*

It is found that, of the 50 responding companies, over 50 percent of their sources of capital comes from Hong Kong, 14 percent comes from USA, 12 percent comes from joint ventures and 8 percent comes from Japan. This shows that the majority of the respondents are local companies.

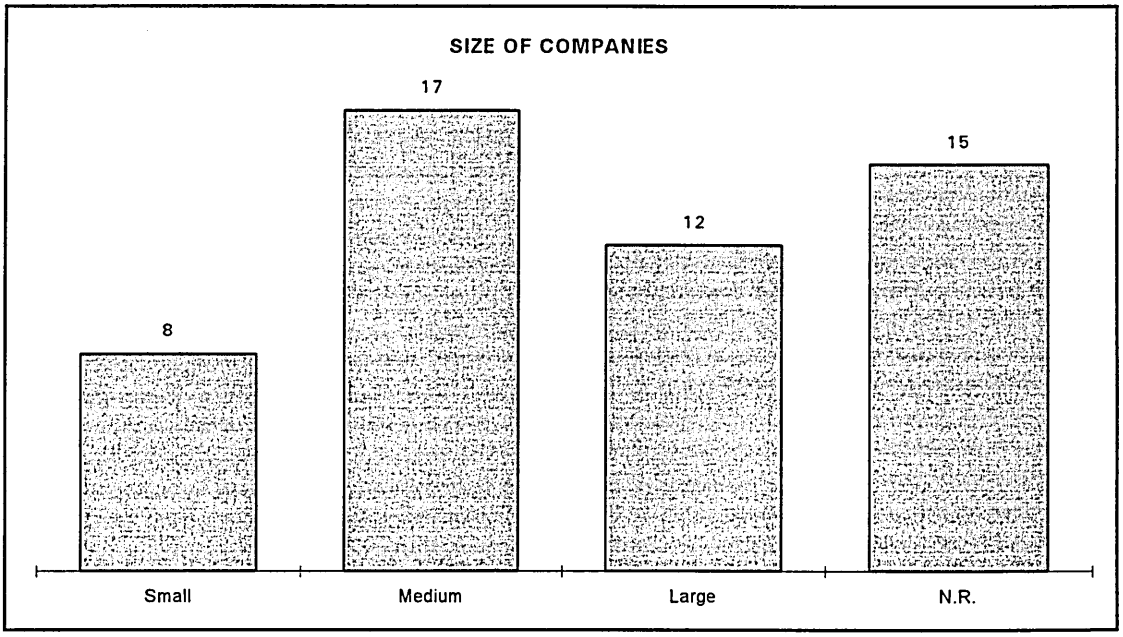

Figure 12: *Size of Companies*

Companies with less than 50 employees are classified as "Small", those with 50 to 500 as "Medium" and those with more than 500 as "Large". Their respective frequencies are shown in figure 12 above. It is found that the majority (78.4%) of the respondents are medium to large companies.

Places of manufacturing for the respondents are shown in figure 13 below. It is found that over 90 percent of the responding companies have factories in Hong Kong, in China and in both places. This shows the intimate and interdependent relationships between Hong Kong and China.

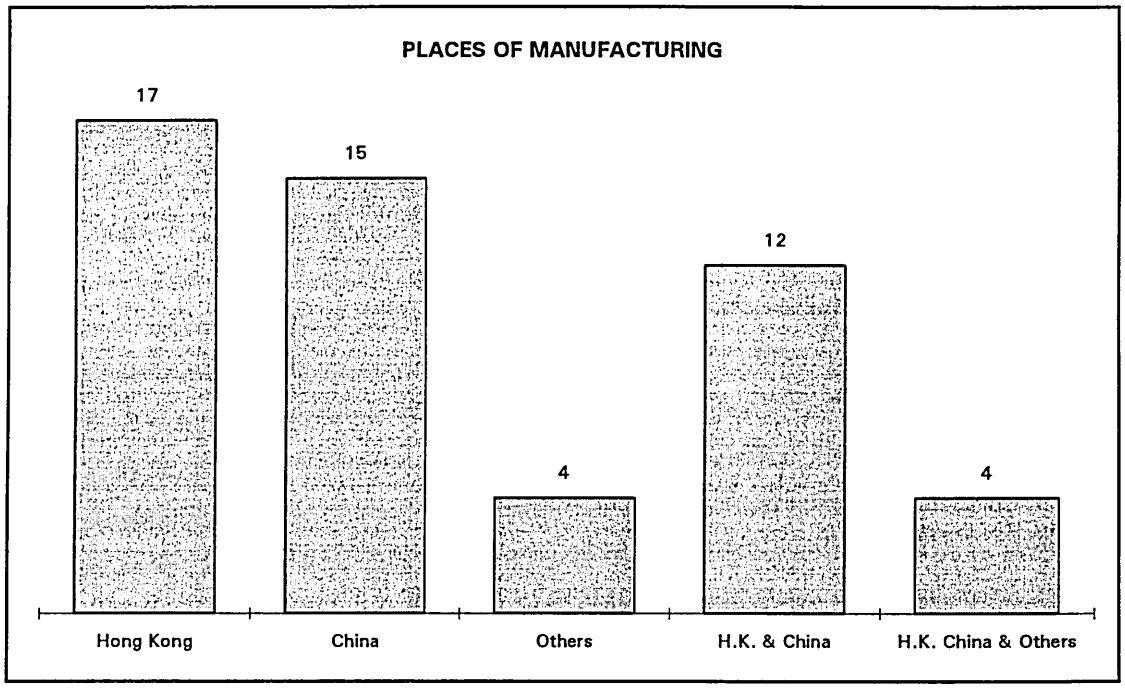

Figure 13: *Places of Manufacturing*

5.1.1 Delight the Customer

Responses pertaining to questions 37, 38, 41, 42, and 43 are reported under CUSTOMER SATISFACTION, and; questions 25, 36 and 39 under INTERNAL CUSTOMER IS REAL below.

CUSTOMER SATISFACTION

When asked whether the company has a formal system to make and check directions for its products, 29 companies responded "YES", 19 responded "NO" with 4 non-respondents. This shows that a reasonable proportion (60.4%) of companies have put such formal systems in operation.

With regard to courses to educate customers, 20 companies responded "YES", 28 responded "NO" with 4 non-respondents. This shows that quite a proportion of the responding companies (58.3%) are lagging behind in their promotion strategy in that they do not see educating their own customers as an alternative way to better achieve a pull promotion strategy which can, not only foster a better customer relationship, but also increase sales.

On a system to check legal aspects of sales and marketing activities, 28 companies responded "YES" they have, 18 responded "NO" with 6 non-respondents. This shows that a reasonable proportion of respondents (60.9%) are conscious of their legal obligations and liabilities.

SYSTEM TO CHECK	Freq.
If customers are satisfied with the products	38
That goods are delivered to the right customers	41
That sales agents are doing what they are instructed	24
Whether the sales people are living up to standard	26
Whether deliveries are arriving on time	37
Other quality matters	26

Table 3: *System to Check Quality of Service/Products*

Table 3 above summarises the uses of a system by the responding companies to check the quality of their service/products. It is found that the three most frequent uses of the system are to check that goods are delivered to the right customers (78.8%), to check if customers are satisfied with the products (73.1%), and to check whether deliveries are arriving on time (71.2%). All these indicate that satisfying customers is a major concern for the responding companies, and for the manufacturing industries in general.

Table 4 below summarises the responses to the question: "How do you recognize changes in customers?"

METHOD	Freq.
Information from sales force or agents	46
Systematic market panels or surveys	25
Ad hoc panels or surveys	17
Others	3

Table 4: *Methods to Recognise Changes in Customer Needs*

It is found that the two major methods used by the responding companies to recognise changes in customer needs are from the sales force or agents (88.5%) and from systematic market panels or surveys (48.1%). It can be envisaged that information on changes in customer needs mainly come through the sales force or agents which, in a way, can strengthen the supplier-customer relationship and can partly serve the purpose of educating the customers.

Table 5 below summarises the responses to the question: "How do you motivate your employees to perform according to quality goals?"

METHOD	Freq.
Bonus for high quality	19
Quality campaigns	30
Economic reward	26
Quality control circle activities	13
Job rotation	6
Others	4

Table 5: *Methods of Motivation to Achieving Quality Goals*

It is observed that the quality campaign (57.7%) is the method which most of the responding companies used to motivate their employees to perform in seeking the attainment of quality goals, and the proportion is considered satisfactory. This, somehow, acknowledges the fact that, to both employees and employers, being recognised for one's achievements formally and publicly is valued higher than monetary rewards (50%). The effects are long-lasting, raise morale and set examples for others to follow.

With regard to the question: "Do you have a system to select sales agents?" 16 companies responded "YES", 13 responded "NO, but we have sales agents", 17 responded "NO, we do not have sales agents" with 6 non-respondents. This indicates that not many responding companies have a system to select their sales agents and the proportion (34.8%) is considered low.

When asked whether the company has an educational programme for its sales agents, 21 companies responded "YES", 27 responded "NO" with 4 non-respondents. Despite of the fact that most of the respondents use sales agents to collect information on customer needs, less than 50 percent of them offer educational programme for their salesforce which is marginally better than that for their customers.

5.1.2 Management by Fact

Responses pertaining to questions 7, 8, 9, 23, 32, 40, 44, 50, 51 and 56 are reported under MEASUREMENT, and; questions 19, 20, 46 and 47 under ALL WORK IS PROCESS below.

MEASUREMENT

When asked whether the company has a quality document (QD) describing its policy about quality and quality control, 42 companies responded "YES", 9 responded "NO" with 1 responded "WORKING OUT". The uses of QD by these 42 companies are summarised in table 6 below:

USES OF QUALITY DOCUMENT	Freq.	%
By top management when deciding on quality strategy	14	33.33
By middle management in quality planning	36	85.71
Not communicated to all employees	7	16.67
Continuously communicated to all employees	31	73.81
An important input for designing QC-training	39	92.86
An important factor for creating quality culture	40	95.24
Known to all blue workers	26	61.90

Table 6: *Uses of Quality Document*

It is found that the three most frequent use of a QD by the responding companies is for creating a quality culture (95.2%), for designing QC-training (92.9%) and for quality planning by middle management (85.7%). Only a small proportion (16.7%) of the responding companies do not communicate their QDs to all of their employees.

With regard to a quality handbook, 39 companies responded "YES", 11 responded "NO" with 2 non-respondents. This shows that a high proportion (92.9%) of the responding companies have upgraded their QDs to quality handbook status.

Of the 31 companies responding, the average number of hours per year spent on educational and training activities per employee ranges from 2 to 650 hours with a mean of 67.81 hours and a standard deviation of 139.31 hours. The distribution is highly positively skewed with only two respondents reporting average of more than 100 hours per year spent on educational and training activities per employee. When these two extreme values are discarded, the revised mean and standard deviation are 32.83 and 27.38 hours respectively. This reveals that employers, in general, are not putting sufficient effort and emphasis on educational and training activities for their own staff.

When asked whether the company has a system to evaluate the employees, 44 companies responded "YES" and 8 responded "NO". This shows that employers, in general, consider the system essential for checking the effectiveness, efficiency and quality of their workforce.

In regard to the use of test marketing, 21 companies responded "YES", 26 responded "NO" with 5 non-respondents. It is found that test marketing is not a widely used technique.

The techniques used by the marketing department to analyse the received information are listed in the table 7 below:

TECHNIQUE	Freq.
Cluster Analysis	21
Factor Analysis	21
Multidimensional Scaling	8
Perceptual Mapping	20
Other techniques	9

Table 7: *Techniques Used to Analyse the Received Information*

It is found that cluster analysis, factor analysis and perceptual mapping are the three techniques most frequently used by the marketing department to analyse the information received.

Methods used by the respondents to check the quality of their suppliers are summarised in table 8 below:

METHOD	Freq.
By lot inspection	41
Analysing control charts from suppliers	12
Checking the process capability index from suppliers	13
Checking is done in own production process	30

Table 8 : *Methods Used to Check the Quality of Suppliers*

It is found that lot inspection is the method most frequently used by the responding companies with checking done in the companies' own production process coming second.

In regard to whether the "Concept in Statistical Control" is used when checking production processes, 25 companies responded "YES, always", 15 responded "YES, sometimes", 2 responded "NEVER", 6 responded "Do Not Know This Concept" with 4 non-

respondents. This indicates that the concept of SPC is widely known (83.3%) among companies in the manufacturing industries.

With regard to the use of the concept "Average Outgoing Quality" (A.O.Q.), "Lot Tolerance Percentage Defective" (L.T.P.D.) or similar concepts, 32 companies responded "YES", 12 responded "NO", 7 responded "Don't Know" with only 1 non-respondent. This indicates that there are quite a number of Hong Kong manufacturers still employing the traditional concept of "Product Quality"; even though the TQM campaign was entering into its fifth year at the time of the survey.

ALL WORK IS PROCESS

Table 9 below summarises the responses to the question: "How are the tasks of an employee in the company defined?"

TASKS DEFINED	Freq.
Through objectives defined by manager	50
Through objectives defined by the employee himself	4
Through objectives defined by a group of employees	4

Table 9: *Ways that Tasks of an Employee are Defined*

It is found that, in 96.2 percent of the responding companies, tasks of an employee are defined through objectives of the management as traditionally expected.

In regard to the use of work standards (quotas) on the factory floor, 41 companies responded "YES", 8 responded "NO" with 3 non-respondents. This indicates that meeting quotas remains a primary goal for shopfloor workers.

When asked whether the company performs process capability studies, 32 companies responded "YES", 13 responded "NO" with 7 non-respondents. This shows that manufacturers, in general, do see production as an important process that needs close monitoring. The utilisation of the process capability study results of these 32 companies is summarised in table 10 below:

UTILISATION	Freq.	%
Choice among alternative processes	28	87.50
Purchase of machinery	26	81.25
Selection of workers	21	65.63
Determining the economic aim of a process	25	78.13
Establishing control limits	27	84.38
Others	2	6.25

Table 10: *Utilisations of the Process Capability Study Results*

It is found that utilisation of the process capability study results are for, in descending order, selecting among alternative processes (87.5%), establishing control limits (84.4%), purchase of machinery (81.3%) and determining the economic aim of a process (78.1%).

5.1.3 People-Base Management

Responses pertaining to questions 27, 28 and 53 are reported under TEAMWORK, and; questions 10, 11, 15, 24, 31 and 33 under PEOPLE MAKE QUALITY below.

TEAMWORK

There are 17 companies responded to the question: "What is the share of employees in your company, who participate in QCC activities?" On average, 56.37 percent of the employees who

participate in QCC activities are from the production department while 43.63 percent are from other departments. Further, 37.94 percent of the QCCs are characterised as active, 51.18 percent as modestly active and 11.47 percent as sleeping. This indicates that QCC movements in the manufacturing industries of Hong Kong are still critically lacking promotions and initiatives.

When asked whether exchanges of quality control technology and know-how with suppliers are made, 18 companies responded "YES, always", 24 responded "YES, sometimes", 8 responded "NEVER" with 2 non-respondents. This shows that good relationships and communication between manufacturers and suppliers prevail; particularly on issues of quality and quality control technology.

PEOPLE MAKE QUALITY

In responding to the question of who participates in defining quality goals, 49 companies responded "TOP MANAGEMENT", 46 responded "MIDDLE MANAGEMENT" and 24 responded "MAIN CUSTOMERS". This reflects the total involvement and commitment of management, with inputs from main customers, to keeping the company on course for TQM.

Participation by various departments in design review at various stages during the development of new product are summarised in table 11 below:

Department	Preliminary freq	Preliminary rank	Intermediate freq	Intermediate rank	Final freq	Final rank	Total rank	Overall rank
R & D	30	2	28	4	29	5	11	4
Production planning	20	6.5	28	4	29	4	14.5	5
Purchasing	15	9	22	7	23	7	23	8.5
Production	19	8	31	1	34	1.5	10.5	3
Sales	20	6.5	18	8	22	8	22.5	7
Marketing	26	3	23	6	25	6	15	6
Quality	24	4	29	2	30	3	9	2
Top management	33	1	28	4	34	1.5	6.5	1
Finance	8	10	12	10	18	10	30	10
Main customers	21	5	14	9	20	9	23	8.5

Table 11: *Department Participation in Design Review during Development of New Product*

It is found that **top management** has been ranked top overall for participation in design review during the development of a new product especially in the preliminary and final stages; the **quality department** comes second overall with participation evenly distributed throughout the three stages; the **production department** comes third overall with serious involvement from the intermediate stage onward. At the other end, the **finance department** scores the lowest rank in each of the three stages. This is perhaps due to its limited role in providing information on the viability in the financial or budgetary perspective of the various projects.

It is worth noting that the **R & D department**, the **marketing department** and the **main customers** which greatly participated in the preliminary stage, with respective ranks of 2, 3 and 5, have relatively low participation, to different degrees, in subsequent stages. For the marketing department and the main customers, their principle roles in the preliminary stage are to provide inputs and ideas for further

development of current products as well as for development of new products. This, perhaps, explains their low participation in subsequent stages; especially that of the main customers. As for the R & D department, its main role in the preliminary stage is to scrutinise every proposed product development plan, whether for new products or existing products, on technical viability, and it keeps close watch on their developments in subsequent stages.

Participation in regular audit in a company's quality control efforts and results are summarised in table 12 below:

PARTICIPANT IN REGULAR AUDIT	Freq.
Top management	39
Management of the production department	37
Middle management of the production department	29
All other employees of the production department	15
Management of QC department	38
Management of other department	30
Others	4

Table 12: *Participation in Regular Audit of Quality Efforts and Results*

It is found, in general, that **management** is heavily involved in participating in regular audit. In descending order of the top four most involved are top management (75%), management of QC department (73.1%), management of production department (71.2%) and management of other department (57.7%).

On company support for employees who want to follow job relevant voluntary external courses, 28 companies responded "YES, always", 22 responded "YES, sometimes", 1 responded "NEVER" with only 1 non-respondent. This shows that employers, in general, are

supportive of employees' initiatives to taking external courses which are relevant to their job.

Methods used by the responding companies to ensure employees are active in making suggestions are summarised in table 13 below:

METHOD	Freq.
Monetary rewards	14
Standards or goals for the number of suggestions	20
Prizes and awards	19
Competitions	8
Education/training	30
Bonus system	19
Others	3

Table 13: *Methods to Ensure Employees are Active in Making Suggestions*

It is found that education/training (57.7%) is the method used by most of the responding companies to ensure employees are active in making suggestions. Standards or goals for the number of suggestions (38.5%) comes second. Prizes and awards (36.5%) and bonus systems (36.5%) are both third. This indicates that the relationships and the understandings established in the education/training programmes can indeed improve the communication channel and facilitate the making of suggestions easier.

The uses of formal evaluation result by the responding companies are summarised in table 14 below:

PURPOSE OF EVALUATION	Freq.
To dismiss unqualified persons	24
To find candidates for promotion	38
To decide on salary and wages	38
To start new education	32
To rotate people	26

Table 14: *Uses of Formal Evaluation Result*

It is found that the purposes of the evaluation are mainly to find candidates for promotion (73.1%), to decide on salary and wages (73.1%) and to start new education (61.5%). Most of the responding companies use the evaluation results in positive ways, but quite a number of them use the evaluation results to dismiss unqualified persons (46.2%).

5.1.4 Continuous Improvement

Responses pertaining to questions 14, 26, 29, 30, 34, 48 and 49 are reported under CONTINUOUS IMPROVEMENT CYCLE, and; questions 12, 13, 16, 52, 54 and 55 under PREVENTION below.

CONTINUOUS IMPROVEMENT CYCLE

When asked whether the company has regular audits in its departments on quality control efforts and results, 44 companies responded "YES", 6 responded "NO" with 2 non-respondents. This indicates that management is concerned with the attainment of improvements and engage in follow-up actions in accordance with the recommendations from the audit.

It is found that, of the 17 responding companies, the number of quality circles ranges from 1 to 20 with a mean 4.76 and a standard

deviation of 5.18. This indicates that QCC activities are still in an early development stage and are likely to require more effort and promotion from the management and, more attention and involvement from employees if they are to produce optimal returns.

Of the 51 responding companies, 34 responded "YES" they have systems to ensure that employees make suggestions about quality improvements while 17 responded "NO". Further, of those responded "YES", 2 indicated that they accept "INDIVIDUAL suggestions only", another 2 accepted "GROUP suggestions only" with the majority, 30 of them, accepted "BOTH". This shows that management, in general, is open and eager to listen to suggestions.

The frequency response of companies on respective sources used to obtain information on quality problems are summarised in table 15 below:

Source of Information	***Management***	***Employees***
Informal face to face meetings	28	29
Informal group meetings	22	29
Written reports	39	22
Formal meetings	35	25
Suggestion systems	18	16
Others	3	3

Table 15: *Sources of Information on Quality Problems*

It is found that the three most frequently used sources of information on quality problems for management are written reports (75%), formal meetings (67.3%) and informal face to face meetings (53.8%) respectively; and those for employees are informal face to face meetings (55.8%) informal group meetings (55.8%) and formal meetings (48.1%) respectively. This indicates that management

depends largely on formal channels/complaints while employees place reliance on informal meetings to obtain information concerning quality problems.

When asked whether process control charts are used in the production processes, 25 companies responded "YES, always", 12 responded "YES, sometimes", 10 responded "NEVER" with 5 non-respondents. This shows that process control charts are widely known to the responding companies (78.7%), but are not as widely used (53.2%) as might have been expected.

On issues of demand for suppliers to use process control charts, 10 companies responded "YES, always", 17 responded "YES, for Critical Deliveries (Lots)", 19 responded "NEVER" with 6 non-respondents. This shows that demand for suppliers to use process control charts are, to a certain extent, made by the responding companies (58.7%); but few of them (21.7%) make it a requirement.

PREVENTION

Methods used to identify latent quality problems during product development and the causes of quality problems after the development stage are summarised in table 16 below. It is found that customers, group discussions and design review are the three most frequently used methods, with respective overall ranks of 1, 2 and 3, for identifying both latent quality problems during product development and the causes of quality problems after the development stage. This finds compatibility with the customer-driven principle of TQM.

Method	Quality Problem		Quality Cause		Total	Overall
	freq	rank	freq	rank	rank	rank
Cause and effect diagrams	21	7	25	8	15	8
Group discussions	36	1.5	38	2	3.5	2
Quality function deployment	19	8	24	5.5	13.5	7
Controlled experiments	32	4	28	7	11	5
Reliability analysis	27	5	30	3.5	8.5	4
Life time testing	26	6	29	5.5	11.5	6
Design review	34	3	28	3.5	6.5	3
Customers	36	1.5	39	1	2.5	1

Table 16: *Methods Used to Identify Latent Quality Problems and Their Causes*

When asked whether there are formal systems to check the work of the individual department, 23 companies responded "YES, in All Departments", 19 responded "YES, in Some Departments", 8 responded "NO" with 2 non-respondents. This shows that majority of the responding companies (84%) do have formal systems to check the work of all individual department. Only some of them (46%) make it a compulsory activity.

The kinds of information used by the responding companies to evaluate their suppliers are given in table 17 below:

INFORMATION USED	Freq
Economic evaluation	35
Quality evaluation	45
Price evaluation	43
Delivery evaluation	40
No evaluation	1

Table 17: *Information Used to Evaluate Suppliers*

It is found that quality evaluation (86.5%), price evaluation (82.7%) and delivery evaluation (76.9%) are the three kinds of information most frequently used by the responding companies to evaluate their suppliers. Less than 2 percent of them do not have any evaluations.

On issues of quality problems caused by late deliveries from suppliers, 2 companies responded "YES, always", 4 responded "YES, several times per month", 28 responded "YES, sometimes", 12 responded "YES, but seldom", 4 responded "NEVER" with 2 non-respondents. This indicates that quality problems caused by late deliveries are common (92%) but not serious (12%) among the respondents which may be attributed to the heavy traffic particularly in the industrial areas.

Of the 51 responding companies, 43 responded "YES" and 8 responded "NO" when asked if they have a system for preventive maintenance of the production equipment. This shows that preventive measures on the maintenance of production equipment are taken seriously by most of the responding companies (84.3%).

5.1.5 Leadership

Responses pertaining to questions 6, 17, 18, 21, 22, 35, 45 and 57 are reported here in this section.

Leadership can be observed through the **vision/direction** set by management. The importance of various competitive parameters as seen by management can be considered as providing direction and their responses are summarised in table 18 below and a further analysis of these responses can be found in section 5.2.

Competitive Parameter	*Irrelevant*	*Un-Important*	*Modestly Important*	*Rather Important*	*Very Important*
Market price	-	-	4	20	27
Product quality	-	1	2	9	39
Delivery	-	4	10	20	16
Advertising	2	15	17	13	3
Service before sale	-	3	10	19	19
Service after sale	-	2	2	23	24
Assortment	1	5	12	15	14
Warranty	1	-	5	18	27
Handling of complaints	-	-	5	17	30
Product functions	-	2	8	6	36

Table 18: *The Importance of Competitive Parameters for the Company*

It is found that the three parameters which most of the responding companies consider very important are product quality (75%), product functions (69.2%) and the handling of complaints (57.7%). While, at the other end of the spectrum, the three parameters which most of the responding companies consider unimportant or irrelevant are advertising (32.7%), assortment (11.5%) and delivery (7.7%). This, perhaps, explains why quality problems caused by late deliveries from suppliers are so common in the manufacturing industries.

When asked whether quality goals are specified when defining the tasks of an employee or a group of employees, 20 companies responded "YES, always specific quality goals", 15 responded "YES, always general quality goals", 11 responded "YES, sometimes specific sometimes general quality goals", 6 responded "NO, do not specify quality goals". This shows that specification of quality goals when

defining the tasks of an employee or a group of employees are widely practised (88.5%) among the responding companies with some (38.5%) giving it at a high profile.

With respect to quality goals when defining the tasks of an individual department, 26 companies responded "YES, always specific quality goals", 11 responded "YES, always general quality goals", 10 responded "YES, sometimes specific sometimes general quality goals", 5 responded "NO, do not specify quality goals". This shows that the specification of quality goals when defining tasks of an individual department is widely practised (90.4%) among the responding companies with some (50%) giving it at a high profile. The results are very similar to those for an employee or a group of employees, but to greater extent where an individual department is concerned.

With regard to the use of "Management By Objective" (MBO) where the objectives are numeric goals, 36 companies responded "YES", 12 responded "NO" with 4 non-respondents. This indicates that the concept of MBO is in common use (75%) among the responding companies.

The ways in which objectives are communicated to the employees are summarised in table 19 below:

COMMUNICATION CHANNEL	Freq
Through operational instruction manual	25
Through visual instruction	24
Through verbal instruction	48
Through on the spot training	39
Through a written job description	33

Table 19: *Methods of Communicating Objectives to Employees*

It is found that the three methods mostly used by the responding companies to communicate the objectives to the employees are through verbal instruction (92.3%), through on the spot training (75%) and through a written job description (63.5%) with some use of visual instruction (46.2%). This indicates that the workforce supporting the manufacturing industries is highly skilled, very experienced and is capable of taking verbal instructions. This general phenomenon, perhaps, is the major determinant of the fast-moving business activities in Hong Kong.

The methods to inform the salesforce about new products and changes in existing products are summarised in table 20 below:

METHOD OF COMMUNICATION	Freq
Do not inform	4
Organised meetings with the salesforce	37
Seminars	25
Brochures	18
Informal meetings	22
Others	5

Table 20: *Methods to Inform Salesforce about New Products and Changes in Existing Products*

It is found that the three most frequently used methods by the responding companies to inform the salesforce about new products and changes in existing products are organised meetings with the salesforce (71.2%), seminars (48.1%) and informal meetings (42.3%). Few of them do not inform their salesforce (7.7%).

With regard to the use of the Just-in-Time (JIT) principle when planning production, 22 companies responded "YES, always", 18 responded "YES, sometimes", 9 responded "NEVER" with 3 non-

respondents. This indicates that the JIT principle is commonly used (81.6%) by the responding companies, which greatly reduces the storage space required and is particularly suitable to the densely populated Hong Kong environment.

On the desire for ISO 9000 series certification, the responses of the 50 responding companies are described in figure 14 below:

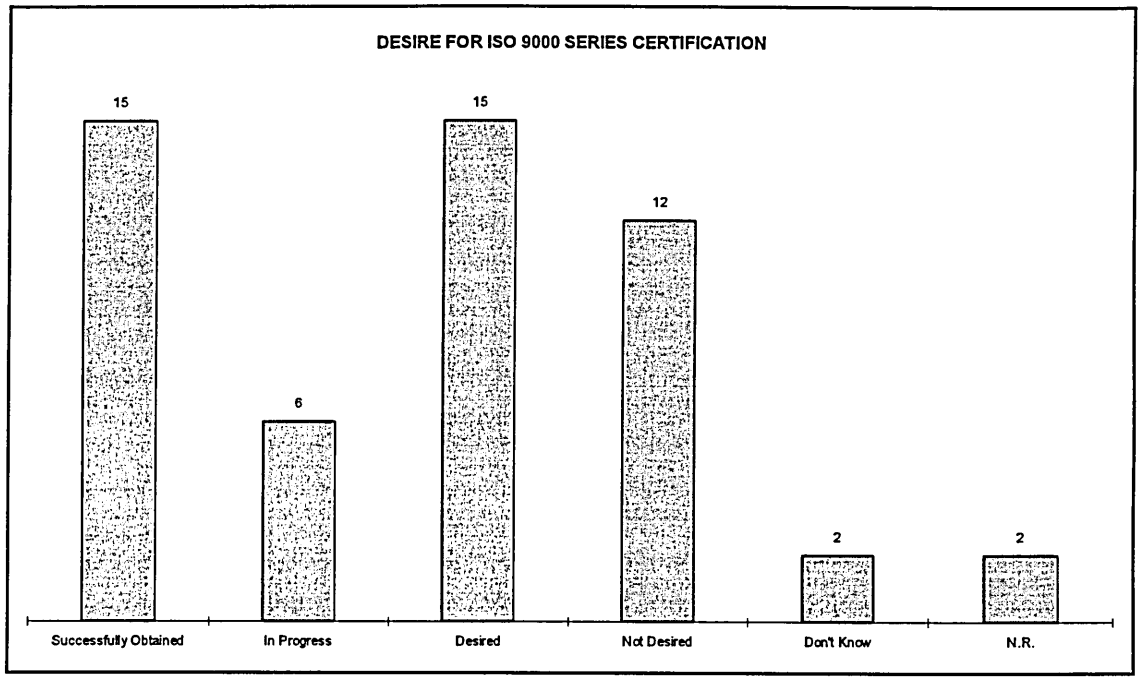

Figure 14: *Desire for ISO 9000 Series Certification*

It is found that, at the time of the survey, 30 percent of the responding companies have successfully obtained the ISO 9000 series certification with another 42 % desiring to do so or in the process of doing so. Only 4 percent of the respondents do not know of ISO 9000. It is not surprising to find that 24 percent of the responding companies do not wish to gain ISO 9000 series certification. After all, the Hong Kong Government only started to promote ISO 9000 and TQM in 1990. Perhaps, the message was not getting across effectively or companies do not see certification as an urgent need.

5.2 FURTHER FINDINGS

As mentioned in **Leadership** (section 5.1.5), the **vision/direction** set by management can be observed through the importance of various competitive parameters as indicated by management and their responses are already summarised in table 18 (page 88). In this section, results pertaining to question 6 (see Appendix I) are compared, among the competitive parameters themselves, using the analysis of variance technique, and their underlying **vision** revealed using the factor analysis technique. Results of tests of independence using the Chi-square test for contingency table are reported accordingly.

5.2.1 Comparisons Among Competitive Parameters

Because of the length for variable labels in SPSS, outputs are limited to eight characters, it would cause a lot of ambiguities if the output consists of labels with the same eight initial characters. For this reason, the computer outputs for the 1-way ANOVA are reproduced:

ANALYSIS OF VARIANCE

Degrees of Importance **by** Competitive Parameters

Source	Sum of Squares	D.F.	Mean Squares	F Ratio	Prob.> F
Between Groups	109.4047	9	12.1561	17.1944	.0000
Error	349.9538	495	.7070		
Total	459.3584	504			

Table 21: *Analysis of Variance for Degrees of Importance of Competitive Parameters*

Summary Statistics

Group	Count	Mean	Standard Deviation	Standard Error	Min.	Max.
Market Price	51	4.4510	.6423	.0899	3	5
Product Quality	51	4.6863	.6478	.0907	2	5
Handling of Complaints	52	4.4808	.6713	.0931	3	5
Service After Sale	51	4.3529	.7436	.1041	2	5
Warranty	51	4.3725	.8237	.1153	1	5
Product Functions	51	4.4510	.9014	.1262	2	5
Service Before Sale	51	4.0588	.9036	.1265	2	5
Delivery	50	3.9600	.9249	.1308	2	5
Advertising	50	3.0000	.9897	.1400	1	5
Assortment	47	3.7660	1.0676	.1557	1	5

Table 22: *Summary Statistics for Degrees of Importance of Competetive Parameters*

The **Summary Statistics** table above has been arranged in ascending order of the standard deviation of the degrees of importance of the competitive parameters. It is interesting to note the formation of four apparently homogeneous groups, in terms of standard deviation; these being market price, product quality and handling of complaints; service after sale and warranty; product functions, service before sale and delivery; advertising and assortment. It is evident that heterogeneous group error variances are present in the data which is confirmed by the low significance level (p-value) of .005 in the Levene Test for Homogeneity of Variance below:

Levene Test for Homogeneity of Variance

Statistics	d.f. 1	d.f. 2	2-tail Sig.
2.6878	9	495	.005

Table 23: *Levene Test for Homogeneity of Variance*

If the **Summary Statistics** table is scrutinised carefully, it can be envisaged that members within each of the four groups are homogeneous representing the convergent views or **visions** of the

management which are very much in line with the findings in the factor analysis in section 5.2.2.

With the slight heterogeneity in group error variances (σ^2_{max} / σ^2_{min} = 2.7627) and the large error degrees of freedom, test for equality of means by the 1-way ANOVA can still be applied with the results being backed by its equivalent non-parametric test, the Kruskal-Wallis 1-way ANOVA. The pairwise comparisons can be applied as usual with a little loss of sensitivity due to the heterogeneity in the variances, which should not cause any trouble (see Liu, 1982, pp.59-60) since the author is not concerned with any estimation problems. If required, Cochran and Cox (1957, pp.79-80, 92) afford a remedial measure to this type of disturbance by dividing the error sum of squares into components each of which is homogeneous.

KRUSKAL-WALLIS 1-WAY ANOVA

Mean Rank	Cases	Parameter
286.58	51	Market Price
334.19	51	Product Quality
217.36	50	Delivery
104.51	50	Advertising
231.79	51	Service Before Sale
272.89	51	Service After Sale
197.97	47	Assortment
280.57	51	Warranty
293.86	52	Handling of Complaints
301.56	51	Product Functions
	505	**Total**

			Corrected for Ties		
Chi-Square	**D.F.**	**Significance**	**Chi-Square**	**D.F.**	**Significance**
93.4951	9	.0000	108.0643	9	.0000

Table 24: *Kruskal-Wallis 1-Way Analysis of Variance for Degrees of Importance of Competitive Parameters*

From the above, both the 1-way ANOVA and the Kruskal-Wallis 1-way ANOVA confirm that the null hypothesis of no

differences in the degrees of importance among competitive parameters can be rejected at .05 level of significance. This indicates that at least two competitive parameters are different in the degrees of importance and the possible pairwise comparisons are being explored by the multiple range test using the least significance method given below:

Multiple Range Tests: LSD test with significance level .05.

(*) Indicates significant differences which are shown in the lower triangle.

MEAN	GROUP	ADVERTISING	ASSORTMENT	DELIVERY	SERVICE BEFORE SALE	SERVICE AFTER SALE	WARRANTY	MARKET PRICE	PRODUCT FUNCTIONS	HANDLING OF COMPLAINTS	PRODUCT QUALITY
3.0000	Advertising										
3.7660	Assortment	*									
3.9600	Delivery	*									
4.0588	Service Before Sale	*									
4.3529	Service After Sale	*	*	*							
4.3725	Warranty	*	*	*							
4.4510	Market Price	*	*	*	*						
4.4510	Product Functions	*	*	*	*						
4.4808	Handling of Complaints	*	*	*	*						
4.6863	Product Quality	*	*	*	*	*					

Table 25: *Multiple Range Test for Degrees of Importance of Competitive Parameters*

It is found, at .05 level of significance, that **product quality** is significantly more important than advertising, assortment, delivery, service before sale and service after sale; *handling of complaints*, *product functions* and *market price*, though no significant differences among themselves in degrees of importance, are significantly more important than advertising, assortment, delivery and service before sale service, and; similarly, *service after sale* and *warranty* are significantly more important than advertising, assortment and delivery; and, *assortment*, *delivery* and *service before sale service* are significantly more important than advertising. This shows that management, in general, considers the importance of, in descending order, *product quality*, *handling of complaints*, *product functions* , *market price*, *warranty and service after sale*, all directed to meeting customer satisfactions, over other competitive parameters.

5.2.2 Underlying Vision on Competitive Parameters

The underlying **vision** on competitive parameters of the management can be revealed using Factor Analysis and the Rotated Factor Matrix is given below: (See Appendix VI for details.)

Rotated Factor Matrix

	Factor 1	Factor 2	Factor 3
Market Price	-.06548	-.01406	*.87283*
Product Quality	*.69374*	.12827	-.05716
Delivery	.34379	*.58130*	.03717
Advertising	.01695	*.70295*	.26258
Service Before Sale	.02228	*.82071*	.03009
Service After Sale	.31904	*.75164*	-.31071
Assortment	*.51478*	.22851	*.60153*
Warranty	*.78579*	.01615	.10445
Handling of Complaints	*.64116*	.46192	.03174
Product Functions	*.75201*	.12511	.01014
Eigenvalue	**3.58343**	**1.41248**	**1.24493**
Cumulative Percentage	**35.8343**	**49.9591**	**62.4084**

Table 26: *Factor Loadings on Degrees of Importance of Competitive Parameters*

The **Kaiser-Meyer-Olkin** (KMO) Measure of Sampling Adequacy is 0.77221 (See Appendix VI) which signifies a green light for running Factor Analysis. Further, the low p-value of 0.0000 for the **Bartlett's Test of Sphericity** for the null hypothesis that the correlation matrix is an identity matrix indicates that the population correlation matrix is unlikely an identity matrix which affirms the result of the KMO measure (See Appendix VI).

In table 26 above, all factor loadings with values exceed 0.500 are shaded and printed in italic. **Factor 1** accounts for 35.83 percent of total variation and has large factor loadings in warranty, product functions, product quality, handling of complaints and assortment. Which can be characterised as management **vision** on *quality aspects aimed at meeting customer satisfactions*.

Factor 2 accounts for 14.12 percent of total variation and has large factor loadings in service before sale, service after sale, advertising and delivery. Which can be characterised as management **vision** on *better service and promotion*.

Factor 3 accounts for 12.45 percent of total variation and has large factor loadings in market price and assortment. Which can be characterised as management **vision** on *better choice available to customers*.

5.2.3 Relationship between Source of Capital and Use of Quality Document

It is suspected that Source of Capital, particularly those from Japan and the US, may have some effects on the Use of QD. Table 27 below gives details of the chi square test for contingency table for Source of Capital and Use of QD. The total calculated chi square is

12.1288 with 36 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{30;0.1}$ = 40.2560, $\chi^2_{40;0.1}$ = 51.8050). It is concluded that Source of Capital and Use of QD are independent.

Obs Exp χ^2	QD Used by Top Mgt	QD Used by Mid.Mgt	QD Not Communicated	Continu. Communicated	Importnt input to QC-train	Importnt to Qual. Culture	Known to ALL workers	Total
China	**0** .2270 *.2270*	**1** .5514 *.3650*	**0** .1135 *.1135*	**0** .4703 *.4703*	**1** .6000 *.2667*	**1** .6324 *.2137*	**0** .4054 *.4054*	**3** *2.0616*
U.S.A.	**1** 2.3459 *.7722*	**5** 5.6973 *.0853*	**0** 1.1730 *1.1730*	**6** 4.8595 *.2677*	**6** 6.2000 *.0065*	**7** 6.5351 *.0331*	**6** 4.1892 *.7827*	**31** *3.1205*
Britain	**0** .6811 *.6811*	**2** 1.6541 *.0723*	**0** .3405 *.3405*	**2** 1.4108 *.2461*	**2** 1.8000 *.0222*	**2** 1.8973 *.0056*	**1** 1.2162 *.0384*	**9** *1.4062*
Japan	**2** 1.4378 *.2198*	**4** 3.4919 *.0739*	**1** .7189 *.1099*	**2** 2.9784 *.3214*	**4** 3.8000 *.0105*	**4** 4.0054 *.0000*	**2** 2.5676 *.1255*	**19** *.8610*
H.K.	**9** 6.3568 *1.0991*	**15** 15.4378 *.0124*	**5** 3.1784 *1.0440*	**12** 13.1676 *.1035*	**16** 16.8000 *.0381*	**17** 17.7081 *.0283*	**10** 11.3514 *.1609*	**84** *2.4863*
Others	**0** 1.0595 *1.0595*	**3** 2.5730 *.0709*	**0** .5297 *.5297*	**3** 2.1946 *.2956*	**3** 2.8000 *.0143*	**3** 2.9514 *.0008*	**2** 1.8919 *.0062*	**14** *1.9770*
Joint Venture	**2** 1.8919 *.0062*	**4** 4.5946 *.0769*	**1** .9459 *.0031*	**4** 3.9189 *.0017*	**5** 5 *0*	**5** 5.2703 *.0139*	**4** 3.3784 *.1144*	**25** *.2162*
Total	**14** *4.0649*	**34** *.7567*	**7** *3.3137*	**29** *1.7063*	**37** *.3583*	**39** *.2954*	**25** *1.6335*	**185** *12.1288*

Table 27: *Cross Tabulation of SOURCE OF CAPITAL and USE OF QUALITY DOCUMENT*

5.2.4 Relationship between Source of Capital and the Methods Used to Communicate Objectives to Employees

Communication is the essential means to shape and to reflect the culture of a company, which in turn is dependent on the source of capital that determines the composition of the Top Management — the

Board of Directors. Thus, it is suspected that Methods to Communicate Objectives to Employees is affected by Source of Capital. Table 28 below gives details of the chi square test for contingency table for Source of Capital and Methods to Communicate Objectives to Employees. The total calculated chi square is *5.4044* with 24 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{24;0.1} = 33.1963$). It is concluded that Source of Capital and Methods to Communicate Objectives to Employees are independent.

Obs Exp χ^2	Through Operational Manual	Through Visual Instruction	Through Verbal Instruction	Through On-the-Spot Training	Through Written Description	Total
China	**1** .7530 *.0810*	**1** .6928 *.1362*	**1** 1.4157 *.1221*	**1** 1.1446 *.0183*	**1** .9940 *.0000*	**5** *.3576*
U.S.A.	**6** 4.6687 *.3796*	**5** 4.2952 *.1157*	**7** 8.7771 *.3598*	**7** 7.0964 *.0013*	**6** 6.1627 *.0043*	**31** *.8607*
Britain	**1** 1.0542 *.0028*	**1** .9699 *.0009*	**2** 1.9819 *.0002*	**1** 1.6024 *.2265*	**2** 1.3916 *.2660*	**7** *.4964*
Japan	**3** 2.1084 *.3770*	**2** 1.9398 *.0019*	**4** 3.9639 *.0003*	**3** 3.2048 *.0131*	**2** 2.7831 *.2203*	**14** *.6126*
H.K.	**9** 10.5422 *.2256*	**7** 9.6988 *.7510*	**23** 19.8193 *.5105*	**17** 16.0241 *.0594*	**14** 13.9157 *.0005*	**70** *1.5470*
Others	**3** 2.8614 *.0067*	**4** 2.6325 *.7104*	**4** 5.3795 *.3538*	**4** 4.3494 *.0281*	**4** 3.7771 *.0132*	**19** *1.1122*
Joint Venture	**2** 3.0120 *.3400*	**3** 2.7711 *.0189*	**6** 5.6627 *.0201*	**5** 4.5783 *.0388*	**4** 3.9759 *.0001*	**20** *.4179*
Total	**25** *1.4127*	**23** *1.7350*	**47** *1.3668*	**38** *.3855*	**33** *.5044*	**166** *5.4044*

Table 28: *Cross Tabulation of SOURCE OF CAPITAL and METHODS USED TO COMMUNICATE OBJECTIVES TO EMPLOYEES*

5.2.5 Relationship between Source of Capital and Ways to Ensure Employees Suggestions

Obs Exp χ^2	Monetary Rewards	Standards for no. of suggestion	Prizes and Awards	Com-petitions	Education Training	Bonus System	Total
China	**0** .2476 *.2476*	**0** .3619 *.3619*	**0** .3429 *.3429*	**0** .1524 *.1524*	**1** .5524 *.3627*	**1** .3429 *1.2592*	**2** *2.7267*
U.S.A.	**0** 2.1048 *2.1048*	**4** 3.0762 *.2774*	**4** 2.9143 *.4045*	**2** 1.2952 *.3835*	**6** 4.6952 *.3626*	**1** 2.9143 *1.2574*	**17** *4.7902*
Britain	**0** .4952 *.4952*	**0** .7238 *.7238*	**0** .6857 *.6857*	**1** .3048 *1.5856*	**2** 1.1048 *.7254*	**1** .6857 *.1441*	**4** *4.3598*
Japan	**1** 1.3619 *.0962*	**3** 1.9905 *.5120*	**1** 1.8857 *.4160*	**0** .8381 *.8381*	**3** 3.0381 *.0005*	**3** 1.8857 *.6585*	**11** *2.5213*
H.K.	**10** 5.6952 *3.2538*	**9** 8.3238 *.0549*	**8** 7.8857 *.0017*	**2** 3.5048 *.6461*	**11** 12.7048 *.2288*	**6** 7.8857 *.4509*	**46** *4.6362*
Others	**1** 1.6095 *.2308*	**1** 2.3524 *.7775*	**3** 2.2286 *.2670*	**2** .9905 *1.0289*	**3** 3.5905 *.0971*	**3** 2.2286 *.2670*	**13** *2.6683*
Joint Venture	**1** 1.4857 *.1588*	**2** 2.1714 *.0135*	**2** 2.0571 *.0016*	**1** .9143 *.0080*	**3** 3.3143 *.0298*	**3** 2.0571 *.4322*	**12** *.6439*
Total	**13** *6.5872*	**19** *2.7210*	**18** *2.1194*	**8** *4.6426*	**29** *1.8069*	**18** *4.4693*	**105** *22.3464*

Table 29: *Cross Tabulation of SOURCE OF CAPITAL and WAYS TO ENSURE EMPLOYEES SUGGESTIONS*

Like communication, reward and punishment can help shaping and reflecting the culture of a company. Thus, it is suspected that Ways to Ensure Employees Suggestions is affected by Source of Capital. Table 29 above gives details of the chi square test for contingency table for Source of Capital and Ways to Ensure Employees Suggestions. The total calculated chi square is *22.3464* with 30 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{30;0.1} = 40.2560$). It is concluded

that Source of Capital and Methods to Communicate Objectives to Employees are independent.

It is worth noting that Hong Kong companies are more inclined to use **monetary rewards**, shaded in table 29 above with cell chi square contribution of *3.2538* ($\chi^2_{1;0.1} = 2.70554$), as a means to ensure employee suggestions though the overall test result is not significant.

5.2.6 Relationship between Source of Capital and Use of Formal Evaluation

Obs Exp χ^2	Dismiss Unqualified Persons	Candidates for Promotion	Decide on Salary and Wages	Start New Education	Rotate People	Total
China	**1** .7516 *.0821*	**1** 1.2092 *.0362*	**1** 1.2092 *.0362*	**1** 1.0131 *.0002*	**1** .8170 *.0410*	**5** *.1957*
U.S.A.	**3** 3.4575 *.0605*	**5** 5.5621 *.0568*	**5** 5.5621 *.0568*	**6** 4.6601 *.3853*	**4** 3.7582 *.0156*	**23** *.5750*
Britain	**1** 1.0523 *.0026*	**1** 1.6928 *.2835*	**2** 1.6928 *.0557*	**2** 1.4183 *.2386*	**1** 1.1438 *.0181*	**7** *.5985*
Japan	**1** 2.2549 *.6984*	**4** 3.6275 *.0383*	**4** 3.6275 *.0383*	**2** 3.0392 *.3553*	**4** 2.4510 *.9789*	**15** *2.1092*
H.K.	**10** 10.5229 *.0260*	**18** 16.9281 *.0641*	**18** 16.9281 *.0641*	**14** 14.1830 *.0024*	**10** 11.4379 *.1808*	**70** *.3374*
Others	**3** 2.2549 *.2462*	**4** 3.6275 *.0383*	**3** 3.6275 *.1085*	**3** 3.0392 *.0004*	**2** 2.4510 *.0830*	**15** *.4764*
Joint Venture	**4** 2.7059 *.6189*	**4** 4.3529 *.0286*	**4** 4.3529 *.0286*	**3** 3.6471 *.1148*	**3** 2.9412 *.0012*	**18** *.7921*
Total	**23** *1.7347*	**37** *.5458*	**37** *.3882*	**31** *1.0970*	**25** *1.3186*	**153** *5.0843*

Table 30: *Cross Tabulation of SOURCE OF CAPITAL and USE OF FORMAL EVALUATION*

Formal evaluation is usually used as the basis for reward and punishment in a company and that is determined by management.

Thus, it is suspected that Use of Formal Evaluation is affected by Source of Capital. Table 30 above gives details of the chi square test for contingency table for Source of Capital and Use of Formal Evaluation. The total calculated chi square is *5.0843* with 24 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{24;0.1} = 33.1963$). It is concluded that Source of Capital and Use of Formal Evaluation are independent.

5.2.7 Relationship between Use of Quality Document and Participation in Defining Quality Goals

Obs Exp χ^2	Top Management	Middle Management	Main Customers	Total
Used by Top Management	**14** 12.9638 *.0828*	**13** 12.6226 *.0113*	**5** 6.4136 *.3116*	**32** *.4057*
QD Used by Middle Management	**36** 36.8657 *.0203*	**36** 35.8955 *.0003*	**19** 18.2388 *.0318*	**91** *.0524*
QD Not Communicated to ALL Employees	**7** 6.8870 *.0019*	**7** 6.7058 *.0129*	**3** 3.4072 *.0487*	**17** *.0635*
QD Continuously Communicated to ALL Employees	**30** 29.9787 *.0000*	**29** 29.1898 *.0012*	**15** 14.8316 *.0019*	**74** *.0031*
Important Input for Designing QC-Training	**39** 39.2964 *.0022*	**38** 38.2623 *.0018*	**20** 19.4414 *.0160*	**97** *.0200*
Important Factor for Creating Quality Culture	**39** 38.8913 *.0003*	**38** 37.8678 *.0005*	**19** 19.2409 *.0030*	**96** *.0038*
QD Known to ALL BLUE collar Workers	**25** 25.1173 *.0005*	**24** 24.4563 *.0085*	**13** 12.4264 *.0265*	**62** *.0355*
Total	**190** *.1080*	**185** *.0365*	**94** *.4395*	**469** *.5840*

Table 31: *Cross Tabulation of USE OF QUALITY DOCUMENT and PARTICIPATION IN DEFINING QUALITY GOALS*

It is reasonable to suspect that Participation in Defining Quality Goals does have a positive effect on the better Use of QD. Table 31 above gives details of the chi square test for contingency table for Use of QD and Participation in Defining Quality Goals. The total calculated chi square is *0.5840* with 12 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{12;0.1}$ = 18.5494). It is concluded that Use of QD and Participation in Defining Quality Goals are independent.

5.2.8 Relationship between Use of Quality Document and Participation in the Audit

Obs Exp χ^2	Top Mgt	Mgt of Prod. Dept.	Mid. Mgt of Prod. Dept.	All other employees Prod.Dept.	Mgt of QC Dept.	Mgt of Other Dept.	Total
QD Used by Top Management	**11** 9.7872 *.1503*	**9** 9.2115 *.0049*	**8** 7.3564 *.0563*	**5** 4.0940 *.2005*	**10** 10.1710 *.0029*	**6** 8.3799 *.6759*	**49** *1.0908*
QD Used by Middle Management	**28** 28.1632 *.0009*	**26** 26.5065 *.0097*	**22** 21.1684 *.0327*	**12** 11.7807 *.0041*	**29** 29.2676 *.0024*	**24** 24.1136 *.0005*	**141** *.0503*
QD Not Communicated to ALL Employees	**5** 5.1932 *.0072*	**5** 4.8877 *.0026*	**4** 3.9034 *.0024*	**3** 2.1723 *.3154*	**5** 5.3969 *.0292*	**4** 4.4465 *.0448*	**26** *.4016*
QD Continuously Communicated to ALL Employees	**26** 26.1658 *.0011*	**24** 24.6266 *.0159*	**19** 19.6671 *.0226*	**11** 10.9452 *.0003*	**27** 27.1919 *.0014*	**24** 22.4034 *.0038*	**131** *.1551*
Important Input for Designing QC-Training	**31** 31.1593 *.0008*	**30** 29.3264 *.0155*	**23** 23.4204 *.0075*	**13** 13.0339 *.0001*	**33** 32.3812 *.0118*	**26** 26.6789 *.0173*	**156** *.0530*
Important Factor for Creating Quality Culture	**32** 31.7585 *.0018*	**31** 29.8903 *.0412*	**24** 23.8708 *.0007*	**12** 13.2846 *.1242*	**33** 33.0039 *.0000*	**27** 27.1919 *.0014*	**159** *.1693*
QD Known to ALL BLUE collar Workers	**20** 20.7728 *.0288*	**19** 19.5509 *.0155*	**15** 15.6136 *.0241*	**8** 8.6893 *.0547*	**22** 21.5875 *.0079*	**20** 17.7859 *.2756*	**104** *.4066*
Total	**153** *.1909*	**144** *.1053*	**115** *.1463*	**64** *.6993*	**159** *.0556*	**131** *1.1293*	**766** *2.3267*

Table 32: *Cross Tabulation of USE OF QUALITY DOCUMENT and PARTICIPATION IN THE AUDIT*

It is suspected that Participation in the Audit of quality control efforts and results does have a positive effect on the better Use of QD. Table 32 above gives details of the chi square test for contingency table for Use of QD and Participation in the Audit. The total calculated chi square is *2.3267* with 30 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{30;0.1}$ = 40.2560). It is concluded that Use of QD and Participation in the Audit are independent.

5.2.9 Relationship between Use of Quality Document and Desire for ISO 9000

Obs Exp χ^2	YES, Successfully Obtained	YES, in Progress	YES, Desired	Total
QD Used by Top Management	**1** 3.2828 *1.5874*	**2** 1.5448 *.1341*	**4** 2.1724 *1.5375*	7 *3.2590*
QD Used by Middle Management	**11** 13.1310 *.3458*	**6** 6.1793 *.0052*	**11** 8.6897 *.6142*	**28** *.9652*
QD Not Communicated to ALL Employees	**0** 1.4069 *1.4069*	**0** .6621 *.6621*	**3** .9310 *4.5980*	**3** *6.6670*
QD Continuously Communicated to ALL Employees	**15** 12.1931 *.6462*	**6** 5.7379 *.0120*	**5** 8.0690 *1.1673*	**26** *1.8255*
Important Input for Designing QC-Training	**14** 14.0690 *.0003*	**6** 6.6207 *.0582*	**10** 9.3103 *.0511*	**30** *.1096*
Important Factor for Creating Quality Culture	**14** 14.5379 *.0199*	**6** 6.8414 *.1035*	**11** 9.6207 *.1977*	**31** *.3211*
QD Known to ALL BLUE collar Workers	**13** 9.3793 *1.3977*	**6** 4.4138 *.5700*	**1** 6.2069 *4.3680*	**20** *6.3357*
Total	**68** *5.4042*	**32** *1.5451*	**45** *12.5338*	**145** *19.4831*

Table 33: *Cross Tabulation of USE OF QUALITY DOCUMENT and DESIRE FOR ISO 9000*

It is suspected that, for those responded "YES", Desire for ISO 9000 series certification does have a positive effect on better Use of QD. Table 33 above gives details of the chi square test for contingency table for Use of QD and Desire for ISO 9000. The total calculated chi square is *19.4831* with 12 degrees of freedom and the null hypothesis of independence can be rejected at 0.1 level of significance ($\chi^2_{12;0.1} = 18.5494$).

Obs Exp χ^2	YES, Successfully Obtained	YES, in Progress	YES, Desired	Total
QD Used by Top Management	**1** 3.3521 *1.6504*	**2** 1.5775 *.1132*	**4** 2.0704 *1.7984*	**7** *3.5620*
QD Used by Middle Management	**11** 13.4085 *.4326*	**6** 6.3099 *.0152*	**11** 8.2817 *.8922*	**28** *1.3400*
QD Continuously Communicated to ALL Employees	**15** 12.4507 *.5220*	**6** 5.8592 *.0034*	**5** 7.6901 *.9410*	**26** *1.4664*
Important Input for Designing QC-Training	**14** 14.3662 *.0093*	**6** 6.7606 *.0856*	**10** 8.8732 *.1431*	**30** *.2380*
Important Factor for Creating Quality Culture	**14** 14.8451 *.0481*	**6** 6.9859 *.1391*	**11** 9.1690 *.3656*	**31** *.5528*
QD Known to ALL BLUE collar Workers	**13** 9.5775 *1.2230*	**6** 4.5070 *.4946*	**1** 5.9155 *4.0845*	**20** *5.8021*
Total	**68** *3.8854*	**32** *.8511*	**42** *8.2248*	**142** *12.9613*

Table 34: *Revised Cross Tabulation of USE OF QUALITY DOCUMENT and DESIRE FOR ISO 9000*

Close scrutiny reveals that the significant result is caused by a low expected frequency of 0.9310, which violates the only requirement for the test, in cell(3,3) giving a chi square contribution of *4.5980*, and a large chi square contribution of *4.3680* from cell(7,3), both of which

are shaded in table 33 above. It is decided to discard row 3 and recalculate the values in table 33 to give table 34 above. The total calculated chi square becomes *12.9613* with 10 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{10;0.1}$ = 15.9871). It is concluded that Use of QD and Desire for ISO 9000 are independent.

It is worth noting that those who responded "YES, Desired" for ISO 9000 are very much lack behind in making the **QD known to all blue collar workers**, shaded in table 34 above with cell chi square contribution of *4.0845* ($\chi^2_{1;0.1}$ = 2.70554), though the overall test result is not significant.

5.2.10 Relationship between Participation in the Audit and Participation in Defining Quality Goals

Obs Exp χ^2	**Top Mgt**	**Mgt of Prod. Dept.**	**Mid. Mgt of Prod. Dept.**	**All other employees Prod.Dept.**	**Mgt of QC Dept.**	**Mgt of Other Dept.**	**Total**
Top Management	**38** 37.2407 *.0155*	**36** 36.0394 *.0000*	**28** 28.4311 *.0065*	**15** 14.8162 *.0023*	**37** 37.2407 *.0016*	**29** 29.2319 *.0018*	**183** *.0277*
Middle Management	**36** 36.4267 *.0050*	**35** 35.2516 *.0018*	**28** 27.8096 *.0013*	**15** 14.4923 *.0178*	**36** 36.4267 *.0050*	**29** 28.5930 *.0058*	**179** *.0367*
Main Customers	**19** 19.3326 *.0057*	**19** 18.7090 *.0045*	**15** 14.7593 *.0039*	**7** 7.6915 *.0622*	**20** 19.3326 *.0230*	**15** 15.1751 *.0020*	**95** *.1013*
Total	**93** *.0262*	**90** *.0063*	**71** *.0117*	**37** *.0823*	**93** *.0296*	**73** *.0096*	**457** *.1657*

Table 35: *Cross Tabulation of PARTICIPATION IN DEFINING QUALITY GOALS and PARTICIPATION IN THE AUDIT*

It is suspected that Participation in Defining Quality Goals and Participation in the Audit of quality control efforts and results are related in that they both represent commitments to TQM. Table 35

above gives details of the chi square test for contingency table for Participation in the Audit and Participation in Defining Quality Goals. The total calculated chi square is *0.1657* with 10 degrees of freedom and the null hypothesis of independence cannot be rejected at 0.1 level of significance ($\chi^2_{10;0.1} = 15.9871$). It is concluded that Participation in the Audit and Participation in Defining Quality Goals are independent.

In order to further understand the total quality management approach for the Hong Kong Industries, pitfalls or barriers encountered during the implementation process of two selected companies are described with suggested remedies given in the following chapter.

6. PITFALLS OF TQM IN HONG KONG

The revival of Japanese industries from a devastating state to a world-class leader in a short time span of two decades during the 1950's and the 1960's has been a fairy-tale to many industrial leaders. The successes of General Motors and Rank Xerox in the US through the implementing of TQM, stirred up the impetuous desire for TQM among many other companies. This enthusiasm generated yet more success stories but many encountered barriers which they had failed to surmount (Morris and Haigh, 1996) in their journey to TQM.

Little has been written concerning the difficulties that many firms experience in adopting a total quality approach. Several firms have experienced considerable problems with the introduction, development and measurement of quality improvement. Some programmes are never initiated, and many encounter common barriers. Whalen and Rahim (1994) identify the following common barriers to the implementation and development of TQM:

* **Poor Planning.**
* **Lack of Management Commitment.**
* **Resistance of the Workforce.**
* **Lack of proper Training.**
* **Teamwork Complacency.**
* **Use of an Off-the-Shelf Programme.**
* **Failure to Change Organisational Philosophy.**
* **Lack of Resources Provided.**
* **Lack of Effective Measurement of Quality Improvement.**

They conclude that a quality philosophy is required for the successful implementation of a quality project. This philosophy must facilitate a long-term lifestyle change for the company. Commitment of top management is essential. Substantial inflow of resources, adequate training, workforce participation and effective measurement techniques are some key success factors. Middle management should be motivated to focus on long-term strategies rather than short-term goals. Teamwork is the key to involvement and participation. Groups are encouraged to work closely and effectively, and should focus on quality improvement and customer satisfaction.

Reavill (1995) reveals some fundamental causes of unsatisfactory results like **lack of totality**, **fragmentation** and **omission of those outside the organisation**, and some peripheral causes of unsatisfactory results like ***training***, ***training material***, ***the implementation process*** and ***quality accreditation***. He concludes that frequent causes of failure of TQM implementation are: lack of understanding of the totality of the TQM concept; lack of real commitment, particularly at high level in the organisation; and inadequate resources, particularly in training. Quantified assessment of expectations and organisational gains must be available to avoid confusion concerning success or failure. Like other change processes, the cultural element is of great importance in progressing the philosophy of TQM.

Shearer (1996) considers that everyone on a successful team is motivated by such positive factors as camaraderie, empowerment, and recognition. But, in reality, these are usually balanced by such factors as fear of rejection, fear of powerlessness, and fear of neglect and isolation. In fact, it is the fear of fear that has led to the desire to drive fear from work. But driving out fear means forgetting, overlooking, or denying that fear is a

motivator. He examines six common TQM pitfalls — **discounting current quality, lacking integration, totally empowering employees, mistaking the means for the end, not measuring processes**, and **not punishing resisters** — and concludes that, instead of fighting or denying fear, companies must be practical, honest, and realistic and **make fear work for them**.

Resistance is an inevitable response to any major change. Maurer (1996) describes some common approaches to surmount resistance:

1. **Use power** — Many people believe that the way to overcome resistance is to overpower it. *The use of power may be subtle: a gentle reminder that lets people know who the boss is. Or, it might be a blatant exercise of authority. And force, used to make people support a change, is seldom effective.*

2. **Apply force of reason** — If you have been in a meeting where someone droned on and on, presenting overhead after overhead about the benefits of the new benchmarking system, you have been subjected to the FORCE OF REASON. The overdose of reason tries to overwhelm other people with facts, figures and flowcharts. It is an attempt to *numb them with numbers*. It does not work, because the resistance is rarely a pure rational response. Underlying fears and concerns are usually fueling the resistance, and logic and data alone rarely address what is really going on.

3. **Ignore it** — In fact, many employee involvement initiatives have faltered or died because people failed to take resistance seriously. But failure to pay attention to the concerns of others, actually often gives opponents more power. When people feel their concerns have been overlooked, it can fuel their resolve to be heard. In an effort to protect

themselves, they organise and may even develop sophisticated political skills.

4. **Make deals** — Making deals fails to build support for the idea itself. People who have jumped on your bandwagon simply because a deal has been struck may *lack the energy or commitment to get out and push when your idea stalls on the road to implementation.*

There are no one-size-fits-all strategies for dealing with resistance to change. What works brilliantly in the company across town may be unsuited for yours. But, the five principles below afford a route to lessen resistance to change:

1. **Maintain clear focus** — When facing resistance, and when your goals and ideas come under attack, it is easy to lose your way. Keeping your goal in mind can help you stay on course while navigating through dangerous shoals.

2. **Embrace resistance** — Why move toward resistance? If your goal is to build commitment for your ideas, you must know what blocks it. Who opposes you? What is their opposition to this idea? Do they hate the idea itself? The way you plan to implement? Or is it something directed to you personally? Without exploring the resistance, you can only guess. *Once you know why people are concerned, you can attempt to find common ground...*

3. **Respect those who resist** — It is no easy matter for people to share their questions and concerns in situations where they fear they may have something to lose. To break those barriers, people must feel both you respect them, and that you are sincerely interested in what they have to say. It is up to you to commit to listening with an open heart and mind.

To create a climate of trust and openness *you must also be telling the truth…*

4. **Stay calm to stay engaged** — Dealing with resistance can be very stressful. People attack you and your precious ideas. Sometimes they seem to show no respect for you. Relaxation is key; the more you relax, the easier it will be for you to embrace resistance. *Relaxation does not mean giving in or giving up…* It simply means staying calm to stay engaged. As other people attack your position, you listen, you draw them out. A more productive approach is to use (2) above as a way to begin seeking common ground.

5. **Join with the resistance** — Building support for change comes from blending your intentions with those of others. The secret is in finding ways to combine "What is in it for me and my group?" with "What is in it for them?" to yield "What is in it for us?" If you are at the beginning of the change, you have the possibility of joining with the resistance to create something new. *Before opinions have had time to calcify, you can search for a common vision.* In essence, there is little to resist since you are developing the plan together.

With the intention of raising the awareness of some of the more common barriers to the implementation of TQM and the prevention to the recurring ones, Morris and Haigh (1996) list below some of the causes that barriers can arise:

- **organisational:** lack of management will; *lack of a properly discernible and properly managed implementation vehicle i.e. a comprehensive and coherent model*;

- **executional:** problem statement contains inherent flaws e.g. the statement of the quality problem is too broad and/or implies cause-effect and thus prevents systematic diagnosis and rational solution; *teams lack appropriate training and education are improperly constructed and their activities are improperly coordinated; past practice and experience limit solutions*; solutions only work in the short term because of a failure to appreciate that there is a hierarchy of desirable solutions involving quality and acceptance;
- **perceptual:** stereotyping of problems generates incomplete problem identification, incomplete solution generation and incomplete solution implementation;
- **emotional:** fear of taking risks; *no appetite for uncertainty*; judging rather than generating ideas;
- **environmental:** autocratic supervision; *lack of trust and cooperation*; lack of support: monetary, moral, physical, emotional.

Other barriers undoubtedly exist which are less readily categorised but which warrant mention. Because they have the potential to become barriers, Morris and Haigh (1996) designate these adverse features as "traps" below:

- **Training Trap:** where the only tangible result which can be defined is the number of people trained.
- **"For the Troops" Trap:** where the responsibility for poor quality has been passed to those at the lowest level of the organisational hierarchy.
- **Technique Trap:** where some technique is thought to provide the answer to quality improvement e.g. SPC, Taguchi, etc....

- **Technology Trap:** where some technology is thought to provide the answer to quality improvement e.g. JIT.
- **Hawthorne Trap:** since any management focus yields a short term improvement in results, this causes many organisations to believe that they are on the right track.
- **Doldrums Trap:** when the organisational enthusiasm and commitment to the process falls off; typically, after the initial training period has been completed.
- **Measurement Trap:** where the approach is to put measurement charts on everything that moves.
- **Management Isn't Committed Trap:** an almost universal complaint of a lack of tangible action on the part of senior managers.
- **Doing Quality Trap:** the idea that quality improvement is something outside the realm of people's real jobs.
- **Participative Management Trap I:** management unwillingness to let go of the reigns of power/control and embrace employee participation.
- **Participative Management Trap II:** the failure to adopt a pro-active strategy to cause participative management to become manifest and the assumption that it will occur as a natural consequence of a quality improvement initiative.
- **Quick Fix Trap:** where a TQM initiative is seen as affording a swift solution to any organisational problem.
- **Quick Return Trap:** where a TQM initiative is seen as providing instant cost savings, increased market share etc....

As to the means of prevention, these must be located in the effective management of the operational principles which are at the centre of the philosophy of TQM.

Kanji (1996) lists below the main pitfalls which seemed to affect the company's implementation of TQM:

1. The managing director (MD) *undermined the creation of a constancy of purpose*, by frequently changing organisational goals and priorities.
2. The MD *failed to adopt the new philosophy*, by choosing to adopt only the parts that suited his viewpoint and ignoring objective evidence that did not support his opinions.
3. The MD *failed to become a leader of change*, by applying the brakes whenever he thought his control was being threatened.
4. The MD *would not resource external training provision* to improve the skills base of the workforce, refusing for example to finance an industry-recognised course identified to improve the skills of the promoted contracts manager.
5. The MD's *management style relied on* ***fear and intimidation to control*** the workforce, making the consequences of open dissent abundantly clear.
6. The MD *created barriers between the departments*, by discouraging informal associations where he was not present to keep an eye on things.
7. The MD *inhibited the growth of a learning culture*, by blocking attempts to invest in developing the skills of the workforce beyond the status quo.

8. The MD *allowed certain people to become overworked*, by failing to allocate work realistically or spread fairly, due to a misguided belief that overworking equated to achieving more work.

9. The MD *failed to make decisions on the basis of objective evidence* ***which conflicted with his opinions***, relying instead on his intuition and what he knew was really happening.

10. The MD *blocked the company-wide continuous improvement drive*, by limiting the scope of the quality improvement programme to those areas he thought caused all the problems.

11. The MD *made teamworking and quality improvement* ***second in importance*** *to commercial expediency*, by favouring getting the work out over getting the work right.

12. The MD *created policies in secret,* ***often contrary to previously agreed*** *policies*, and announced these without consultation with those directly affected by their consequences.

Kanji (1996) continues to comment that these main pitfall statements all begin with the MD, and this really was the main problem. It was the MD who decided that the company would embark on a quality improvement programme in the first place, yet it was also he himself who refused to support the comprehensive cultural change required. Failing to support the changes required to improve will cause far more unpalatable changes ultimately in response to external factors over which one has little control.

In this section, the implementation process of the two selected companies — **Wo Kee Services Limited** and **SKF China Ltd.** — are studied, both of which have recently obtained the ISO 9002 certification,

and through which the pitfalls of TQM as encountered in Hong Kong are depicted and suggested remedies are given.

6.1 THE CASE STUDIES

Personal interviews (see Appendix II for questionnaire) are used to collect relevant data for the two companies which were conducted in the period of January/February of 1996. The questionnaire employed focused on getting information on quality-related activities and major difficulties faced prior to or during different phases of implementation within the two companies. Interviewees were invited to rate on different quality barriers that they considered as most influential to their companies. In addition, heads of five different departments for each company were also interviewed on TQM concepts and the implementation process in the company. The results are given below.

6.1.1 Wo Kee Services Limited

Wo Kee Services Limited (WKSL) is a wholly-owned subsidiary of the **Wo Kee Hong Group** established in 1982 to centralise the distribution, warehousing and servicing operation for the Group as a means of improving efficiency. Its main business is to provide logistics support and aftersales services to the trading products of the Group to meet the needs of customer and to maintain the quality of the brands such as Pioneer, Alpine, Rogers, AEG, Maytag, Marantz, Sansui, Mitsubishi Heavy Industries, Amana, Audio-Technica, and etc.

The company is divided into two main divisions — Customer Services Division and Warehouse and Transport Division. The main function of the Customer Services Division is to provide indoor and

outdoor maintenance services and repairs, product delivery services to customers. The main function of the Warehouse and Transport Division is to provide delivery services and warehousing services to the Group's Sales Companies. Furthermore, the company also gives much logistics and technical support to the Group during an Audio and Visual Fair which is held annually at the Hong Kong Convention and Exhibition Centre.

Other than the three service centres located at Kwai Chung, Mongkok and Macau, the company also develops its business in the Mainland China with 21 maintenance service centres established in Shenzhen, Guanzhou, Shanghai, Beijing, Chengdu, Xian, Dalian, Nanjing , Wuhan, etc.

As of March 1996, the company has a workforce of 178 full-time staff — 114 in the Customer Services Division and 64 in the Warehouse and Transport Division. All of them are well-trained and qualified to carry out their duties.

TQM IN WO KEE SERVICES LTD.

In July 1994, a Quality Assurance Section (QAS) was set up to plan and to execute quality-related issues. At the same time, the company made its application for the ISO 9002 Certification as a basic quality requirement and a stepping stone to TQM. While waiting for the official certification audit, training were carried out by the QAS staff on the certification procedures and on the skills to tackle the assessor. With the training and mock exercise, staff had built up confidence ready for the formal assessment.

In February 1995, WKSL went through a 3-day formal certification assessment by the HKQAA and successfully obtained the ISO 9002 Certification on March 23, 1995. The following key elements which are important for a company to implement TQM are reported below:

1. Management Commitment

With the purpose of *making top management commitment visible* to all employees, the Deputy Director of the company was appointed as the Management Representative in order to ensure the effective implementation and, that the maintenance of the quality system of the company is in full compliance with the ISO 9002: 1994 Standard. He is responsible for scheduling internal quality audits and to ensure that these activities are carried out as planned.

Other than the Management Representative, an ISO 9000 Project Committee, comprising personnel drawn from different divisions and departments, including representatives of all levels of management, was set up. The major function of this committee is to hold regular quality meeting in order to continuously review the suitability and effectiveness of the quality system. This review, known as the Quality Management Meeting (QMM), is held at three-month interval. During the meeting, the following topics are reviewed and discussed:

- adequacy and suitability of the present Quality System;
- training plan;
- the results of Internal Quality Audit;
- complaints records;
- corrective and preventive action;

- vendor/sub-contractor performance report;
- results of customer survey;
- statistical report, and;
- other quality-related issues.

2. Quality System Procedure

Since TQM relies on sound and systematic planning, the need to ensure that the work procedures are clearly communicated and effectively implemented and maintained throughout the company is very important. To this end, the operation procedures of the company are well defined and documented. There are four levels of quality system documentation in use in the company:

1. Quality Manual.
2. a) Procedure Manual.
2. b) Department Manual.
3. a) Work Instruction.
3. b) Services Manual/Specification/Drawings/International Standard.
4. Quality Record.

In addition, to detail a step by step process, responsibilities, procedure manual or work instruction reference and related quality records, a general flow of the following processes is documented in the quality plan:

- indoor repair services;
- outdoor repair services;
- audio/visual/home appliance operation;
- air-conditioning operation.

The Quality Aim of the company is made visible to all staff through the publication of a Quality Policy. The above documentation brings the following benefits to the whole company:

1. duties of staff are clearly defined since all their responsibilities are stated in the Quality Manual and this reduces the prospect of conflict among personnel;
2. work flow becomes clearer and more systematic;
3. quality work and discipline are improved and maintained;
4. mutual understanding and appreciation among departments have been enhanced as a clear job definition for each responsible department and each individual is available;
5. clear document and forms, and;
6. duplication of work is avoided.

3. Education and training for all staff

To ensure commitment to, and understanding of, the quality system, regular seminars are held by the QAS to give all new staff the general concepts of ISO 9002 requirements, quality and TQM.

In addition, every new member of staff is given induction training, under the direction of his Department/Section Head, to make sure that he knows his responsibilities and duties. Special training will be given to specific staff who needs additional skills to perform their duties. For example, training on specifications and repairing skills for new models of audio/visual products are given to technical staff as they come into the market.

The coordination of all in-house training is the responsibility of the Quality Assurance Training Section (QATS) while each Department/Section Head is responsible for reviewing the level of

competence within his area and to identify area where addition training from external sources is required.

Other than the in-house training, staff can attend training courses held by other organisations if such courses are relevant to their present jobs and afford an opportunity to improve their skills. For example, clerical staff in services and administration departments are encouraged to attend external courses on "Elementary Putonghua".

A training plan (see Appendix III) is prepared semi-annually by QATS after consulting all the Heads of Departments/Sections. The main purpose of this plan is to investigate what other training is needed by staff of different departments to upgrade their abilities and efficiencies at work.

4. Internal Audit and Corrective and Preventive Actions

Regular Internal Audits (semi-annually) are carried out by independent trained staff to ensure that all departments continue to operate in accordance with documented procedures and comply with the quality system.

When non-conformance is found during the Internal Audit, a Corrective and Preventive Action Sheet (see Appendix IV) will be issued by QAS and the responsible party will fill it out and return it to QAS within a specified period. The Corrective and Preventive Action is monitored by QAS at reasonable intervals (depending on the proposed actions) and QAS is also responsible for following up whether or not the proposed remedial actions have been implemented.

Similarly, a Sub-contractors Corrective and Preventive Action Request Sheet (see Appendix V) will be issued if non-conformance

related to Sub-contractors is found. In this case, the monitoring and follow-up are the responsibilities of the respective Department/Section Head.

5. Statistical Techniques

The Customer Services Division monthly statistical report includes the following:

- statistical report for WKSL Phonefax Hotline,
- statistical report for outdoor orders,
- statistical report for Carry-in customers.

And, the Warehouse and Transport Division monthly statistical report includes the following:

- statistical report of local delivery,
- statistical report of export delivery.

By analysing these monthly reports, the company can better manage its human, financial and other resources through facts and figures. For example, if the statistical report of local delivery of Air-conditioning Products was to reveal a rapid rise in the number of orders during the period from March to August in the past few years, the company can take remedial actions to soothe the situation by hiring an additional delivery van to handle the increasing orders.

Besides, management can keep track of the performances in different areas of the operation.

6. The establishment of Quality Control Circle

The total involvement of all staff toward the quality system is a significant factor of success of TQM. To promote and foster this total

involvement, the company introduced the QCC programme in July 1995 with aims to:

- increase the staff's involvement and encourage them to participate in the decision making related to their jobs;
- increase the cohesiveness of the staff;
- improve the communication among all levels;
- improve relation between management and workers, and;
- develop leadership of potential staff.

A Steering Committee to take charge of this programme was set up in the same month with its main duties being to make known the QCC concept to staff at all levels and to conduct training programmes on QCC concept, leadership skills, problem identification methods, presentation and proposal writing skills. A recognition and evaluation system was also set up by the Committee to acknowledge those QCCs which had delivered outstanding performances. At present, there are two QCCs in WKSL with sixteen staff involved.

6.1.2 SKF China Limited

SKF is the world's leading manufacturer of roll bearings with its head office in Sweden. Its policy is to provide a full range of roll bearings, to ensure customer's problems are best attended and solved regardless of the types of bearing required. The Group policy also includes maintaining such a geographic presence, either through its own sales companies or through authorised distributors, that SKF is always within reach of its customers. SKF China Ltd. is the sales company located in Hong Kong to serve the Mainland China. There are about 50 people working for the Hong Kong office, including those working in the warehouse.

The Group's presence in China can be dated back as early as 1912 when its office was opened in Shanghai. Since then, SKF had an on-going export flow to China until 1951, when foreign companies were forced to leave the country. SKF returned in 1988 establishing the present company in Hong Kong to serve China. The company has regional offices in Guangzhou, Chengdu, Shanghai, Bejing and Shenyang, with a network of distributors being developed.

Under the Group SKF policy, SKF China Ltd. first introduced TQM in October 1992 and subsequently obtained the ISO 9002 Certificate accreditation in April 1995. The scope of certification is "Marketing, Sales, Warehousing and Distribution of SKF Bearings. (PRC Representative Offices not included)". The company aims for **total quality in everything it does** with the following three quality policy/objectives:

1. market only products and services that will ensure customer satisfactions;
2. operate reliable processes capable of fulfilling approved specifications;
3. maintain a programme of continuous improvement.

TQM IN SKF CHINA LTD.

1. Quality Documentation

Within the company, all work processes and procedures are documented to standardise the ways in which tasks and activities are performed. Quality documentation includes:

a) quality manual,

b) quality procedures,

c) work instructions, and,

d) quality plan.

Any change in documents must be reviewed and approved by the Quality Manager to ensure that the proposed or requested changes are implemented in a disciplined manner.

2. Continuous Improvement

The purpose is to maintain a programme of continuous improvement with **zero defects** as the ultimate goal. All staff are encouraged to discuss with their heads of department any improvement ideas or actions. The head of department concerned is responsible for the approval before implementation. He has to decide whether a Quality Improvement Team (QIT) needs to be formed by considering the scale and efficiency of implementation. If QIT does not need be formed, he may implement the improvement actions through a simple task force.

Whether the improvement action is implemented, either through QIT or through a simple task force, it is carried out in a systematic manner by:

a) defining the problem;

b) identifying the root cause using analytical tools;

c) identifying the best course of action or solution;

d) implementing the solution identified in (c), and;

e) evaluating and recognising the success of (d).

The head of department or the person-in-charge (in the case of a QIT) is responsible for reporting the progress and result to the Quality Manager. Improvement activities are reviewed during management review meetings.

There are three QITs under the Quality Improvement Committee (QIC). All quality-related activities in the company are under the control of, and facilitated by, the QIC. QIT investigates inefficiency problems in the company and implements appropriate actions. The aim of any QIT project is to improve customer service, productivity and to reduce costs.

Innovation award scheme is used to encourage creativity and innovative suggestions which enhance efficiency, productivity, quality and service to customers. All staff are encouraged to submit suggestions to a head of department for assessment.

3. Training

To promote and foster continuous education, training, and the development of all personnel, thereby increasing the general level of competence, an induction programme is arranged for every new employee with the following contents:

a) an introduction to SKF Group and SKF China Ltd.;
b) TQM in SKF China;
c) personnel policy and fringe benefits, and;
d) responsibilities of various functions.

In addition, an annual customer service conference is organised to provide training opportunities in teamwork, customer service and quality. Employees at all levels are required to attend.

The education and training needs of all employees are identified through the year-end performance appraisal exercise. Both in-house and external training is offered to appropriate employees. For example, product training is provided to sales engineers and customer service coordinators, computer training to all staff, etc. A tuition

refund scheme is available to encourage employees to be more effective in their jobs and to increase their potential for development within the company through participation in education and training programmes outside regular working hours.

4. Quality, Teamwork and Customer Service

It is the company strategy to establish a culture of teamwork, customer service, total quality and continuous improvement. This culture, together with objectives to be achieved in each job, is communicated to employees through the induction programme, performance review and day-to-day communication. In addition, an annual customer service conference, with participation from all employees, is organised to provide a training opportunity on team work, customer service and quality.

5. Quality System Audit

The purpose is to verify the effectiveness of the quality system and to ensure that quality procedures are adequate, implemented and followed.

Quality system audit is carried out according to the audit plan by trained personnel assigned by the Human Resources & Quality Manager. The assigned auditors are independent of those having direct responsibility for the area being audited. The auditors are responsible for documenting the audit results. Any non-conformance found is recorded on the Corrective Action Report (CAR) form. The head of department concerned is responsible for taking timely corrective action.

The auditor may also initiate the Preventive Action Report (PAR) form for any potential problem observed during the audit. The

head of department concerned is responsible for studying the justification and implementation of the preventive action. The audit results will be reviewed during the regular management review meeting.

6. Economical Quality Performance

The purpose is to monitor, control and improve the Economical Quality Performance (EQP) by identifying, collecting, measuring and analysing the EQP Failure Costs in all business activities as an initial stage.

EQP consists of Prevention, Appraisal and Failure Costs. Prevention costs are costs for all activities specifically designed to prevent poor quality in products and services. Appraisal costs are costs associated with measuring, evaluating and auditing products and services to ensure conformance to quality standards and performance requirements. Failure costs are the costs of unwanted activities because of process failures and the occurrence of deficiencies, i.e. costs resulting from products and services not conforming to customer needs. There are two types of failure costs — internal and external failure costs. Internal failure costs are incurred prior to the delivery of the product or service to the internal and external customers. External failure costs are incurred after the delivery of product or service to the customers.

In practice, internal failure costs include the estimated time spent in handling and direct costs such as scrapped product, damaged package, air-freight charges incurred from failure of the followings: CAR; delayed deliveries; rush orders due to internal delay; rework including repackaging, scrap handling, information system failure, etc.

External failure costs include the estimated time spent in handling and direct costs such as transportation costs, replacement incurred from the failures of administrative and technical complaints, customer returns, credit note, warranty claims, product recalls, etc.

Heads of departments collect relevant information from staff and submit it to Finance & Account Manager on a monthly basis. Upon receipt of inputs from all departments, the F & A Manager consolidates and measures EQP. The EQP status is reported and analysed during the management review meeting. Also, improvement action is discussed and a failure cost reduction plan is established when necessary.

6.2 PITFALLS OF TQM

Difficulties encountered during the implementation of the ISO 9002 certification requirements of the two companies, which are also the pitfalls of TQM, are reported below together with some suggested remedies.

6.2.1 Pitfalls Encountered by Wo Kee Services Ltd.

1. Lack of Smooth Planning

The absence of a sound strategy has often been blamed for an ineffective quality system. For example, when the QCC programme was first introduced to supervisory level or above in WKSL, the promotion programme and the publication of leaflet did not synchronised with the introduction of QCC. Since developing the right concept and awareness is crucial to achieving success, this greatly reduced the awareness of staff toward the forming of quality circles.

2. Adversarial Relationship Between Management and Non-Management

It is important to note that the lack of a cooperative relationship between management and workforce will never lead to the success of any quality system, since a TQM project must be supported by employees' trust, acceptance and understanding of management's objectives. In WKSL, some of the middle and lower level managers isolate themselves from the shopfloor workers, and, resist consideration of their suggestions. This will form a wall between management and workers, and, if such situation prevails, will lead to a failure of the quality system.

3. Resistance to Change

Aged and illiterate workers and those encountering language barriers may resist the implementation of new ideas and concepts. For example, staff in their *mid-thirties* to *late-forties* who have been working for the company for a long time may think that there is no need for improvement as they have enough experience to perform their duties. Yet, if new or improved work methods, suggested and carried out by the workforce, are implemented as a part of the QCC programme, they come to realise that the ways and methods they have been using in the past are not the best.

4. Misunderstanding of the Top Management

As one of the QCC objectives is to solve day-to-day operational problems, many of the suggested operational problems which the QCC members are trying to solve have been skewed by the management representative since he regards more problems as 'operational'. This then becomes an obstacle for the QAS in its efforts

to implement QCC suggestions because of the misunderstanding of top management.

5. Lack of Proper Communication Between Offices in Different Locations

In WKSL, there are 168 full-time staff and three offices located in Kwai Chung, Mongkok and Macau. Staff in Mongkok and Macau offices may be unaware of the existence of QCC teams.

6.2.2 Pitfalls Encountered by SKF China Ltd.

1. Time Consuming Data Collection

As all TQM decisions are made on the basis of facts and figures, not opinions, it is necessary to collect data for all business activities. Collecting these data on a daily basis is found to be difficult and is considered 'time consuming' by employees.

2. Difficult to Record Internal Failure Costs

External failure costs such as the costs of handling customer complaints, issuing credit notes, warranty claims, etc. are not difficult to measure by counting the number of complaints, the number of credit notes issued, etc. However, it is difficult to measure the internal failure costs such as internal delay deliveries, repackaging, information system failure, etc. Most internal failures are attributable to human errors and it is a common finding that those involved are reluctant to report/record their own mistakes.

3. Misunderstanding of TQM Among Regional Offices

As it is *Group Policy* to implement TQM in all its sales companies, it is inevitable that steps must be taken to implement TQM

in the regional offices in Mainland China. TQM is such a new concept, very different from the traditional management. To implement TQM in the regional offices will encounter difficulties not only for those experienced in Hong Kong, but also language barriers. Since most TQM training materials are in English, it is necessary to translate them into Chinese for ease of understanding.

6.2.3 Pitfalls Encountered by Both Companies

1. Lack of Management Commitment

Although a lot of managers are very experienced in business, they may be innocent or inexperienced in quality management. This leads directly to the problem of *lack of management commitment* during the introductory stage of the quality system since many mangers have little understanding of the subject. In their view, there is nothing wrong with the current system and management as it has been running smoothly so far; thus they exhibit reluctance or even refuse to accept this new management concept.

2. Lack of Proper Training

Poor education and training are major obstacles to the development and implementation of a quality system. Though staff of the Quality Assurance Section may receive sufficient and proper training on quality assurance, *lack of training* at other levels is found in the two companies. For example, in order to qualify as an internal auditor, staff need to attend a 2-day full-time course to obtain the relevant certificate. Since the course provides just the guideline for internal audit, not on specific audit methods, this lack of specific

training will greatly affect the results of the internal audit and raise doubts as to their validity.

3. Lack of Involvement of Staff

The introduction of a QCC/QIT programme in both companies aims to increase the total involvement of staff in the quality system. Some of the employees consider that it is a waste of time for them to attend meetings outside office hours.

4. Resistance to Change From Performance Through Management to Performance Through People

As a major characteristic of TQM is *people-base management*, this brings great challenges to the management of the two companies since, traditionally, objectives are set by management and implemented through their coordination with staff. TQM stipulates that unless the distinction between management and employee is removed, quality systems will not succeed.

6.3 SUGGESTED REMEDIES

To overcome these difficulties or pitfalls, the establishment of an appropriate corporate culture is crucial and creating such a corporate culture requires, fundamentally and essentially, the total commitment of top management. Top management must see that creating an environment for continuous improvements throughout the company is its responsibility. That means each member of the top management team should understand the TQM concept and its implementation thoroughly, know the role he is playing in the quality system and give his whole-hearted support to the system. Methods which encourage an open channel of communication, exchange of ideas, better understanding of customers' requirements and

expectations, closer and better relationship with suppliers and sub-contractors, improvement of quality services and products should be adopted as ways of creating this culture.

By obtaining the perceptions of customers, suppliers and sub-contractors toward the company's services, processes, procedures, marketing and its ability to meet their expectations, the company will learn where it stands and those aspects of its operations that it should improve to satisfy the needs of all parties concerned.

Management should have adequate training and education in order to use quality-related skills more efficiently. Furthermore, better education enhances problem-solving abilities.

A framework is suggested below to allow Hong Kong companies to better plan and implement TQM. It is not a "how-to" guide for TQM but a means to allow users to choose their own starting points and specific courses of action, and to develop individual elements of TQM at a pace that suits their particular situations and available resources.

The framework is divided into four main sections. The **foundation of the framework** is *organising for quality improvement* and the two pillars which form the structure are the use of *systems and techniques* and the *measurement and feedback.* **Changing the culture** is something which must be considered at all stages, but primarily results from other activities within the framework.

6.3.1 Organising for Quality Improvement

This foundation stage of the framework is concerned with the motivation for starting a process of quality improvement and the

resultant strategies and plans which are necessary to introduce the process. The appropriate time to introduce TQM must also be considered, as should communication up, down and across the organisation as to what TQM demands, why it is being adopted and what will be entailed. The TQM approach adopted by the organisation should be flexible and capable of fine tuning. It is also useful during the organising stage to identify the problems and obstacles likely to be encountered in the introduction of TQM together with agreed actions to avoid them or to minimise their impact.

The followings are features identified as keys to organising for improvement:

a) **Executive leadership.** The Chief Executive Officer (CEO) and his senior management team must first buy into the TQM concept, lead and support the initiatives; senior management leadership must be committed to total customer satisfaction. This could be demonstrated by holding discussions with people at operating levels and also with customers. It is important that senior management considers the total operation of the organisation. Issues which should be considered include: *product, price, promotion, distribution channels, service, communication, competition and the business environment.*

b) **Senior and middle management must develop, communicate and formulate vision and mission statements.** It is important that these statements are cascaded down the organisation. These help to unite and focus the organisation toward its objectives. Vision and mission statements are essential and must reflect the long-term strategy of the organisation.

c) **Value system.** An organisation must have a value system which guides behaviour thereby preventing ill-defined assumptions. The emphasis should be on an open system perspective which stresses flexibility, responsiveness, interactive communication. It is also important to identify the flow of information and process responsibilities and to establish a suitable system of rewards. A *good value system may help retain staff* as well.

d) **Establish a TQM steering committee.** This should comprise of executives representing the main functions of the organisation. The *committee must have specific terms of reference*.

e) **Teamwork must be established and become part of the organisation's method of working.** In the first place, it is suggested that taskforces and cross-functional teams be set up to address any major problems arising in the organisation.

f) **Education and training is necessary to build the skills and develop the wills of employees.** Commitment in this area is crucial to quality and productivity improvements, along with encouraging and developing employee suggestions.

g) **An adequate infrastructure for quality improvement** should be established which is both *trim, decentralised and flexible*.

h) **A Key factor in the introduction of TQM is the choice of approach.** This should be strategic, humanistic, work-oriented, multi-departmental and focused on long-term improvements.

i) **Stages of improvement.** The first three stages which should be considered are: awareness, identification of problems and their elimination through improvement actions and reinforcement of the need for continuous improvement.

6.3.2 Systems and Techniques

It involves the development of a quality management system to provide the necessary controls and discipline, and to standardise the improvements. It also involves the use of quality management tools and techniques to, for example, aid quality planning, capture data, control processes, make improvement and so on. The following are key features identified in the application and use of systems and techniques:

a) **Quality system.** A quality manual, departmental procedures and work instructions are prerequisites of a quality system. Management is required to demonstrate leadership in working to the system and in encouraging staff to follow procedures. If formal systems already exist they should be developed and improved. It may be necessary to develop expertise in order to integrate the quality-related systems which are already in place.

b) **The seven quality control tools** (see page 39) should be used by all managers and staff. They are of particular value at the operation level. Perhaps the tools of greatest value are: checksheet (e.g. service standard), cause-and-effect diagrams, Pareto diagrams for setting priorities and control charts (e.g. goods picking in the warehouse). The use of Failure Mode and Effect Analysis (FMEA) should also be considered to identify the internal processes which are most susceptible to errors.

c) **Training** should be carried out in relation to system and technique. The training should emphasize why, how and the benefits.

6.3.3 Measurement and Feedback

It enables the "voice of the customer" to be translated into measures of performance with which the organisation can identify and improve upon. It also focuses on internal measurements, their communication and recognition of success. The following is a list of key features of measurement and feedback:

a) **Research.** Access to customers' views and feelings is critical and there must be a methodology and a system for analysing the statistics gathered from customer complaints.

b) **Customer surveys,** that could be carried out at regular intervals. With reference to market research it was felt that this would be best undertaken by external research company.

c) **Departmental auditing and cross-departmental appraisal** need to be established as should job responsibility and accountability using performance appraisal.

d) **Measurements.** Indicators and tracking systems should be established to reflect the current state of the organisation. These indicators should not be just bottom-line orientations. Executive management needs to recognise that taking external measures is time consuming and extra resources and budget will be required. There should be a well-defined system to feed back the results of any measurements and actions to both customers and staff.

e) **Celebration** and **communication of success** in customer service. This includes the recognition of both individuals and departments by publicising their successes/achievements through newsletters, by awarding certificates, special bonuses, gifts and other things like dinners and overseas trips.

6.3.4 Changing the Culture

Culture change is not just relevant to quality improvement. Although the increased emphasis on customers and their needs within TQM makes some form of culture change a necessity, the current status of the organisational culture from both management and employee perspectives should be established before firm plans for change are developed. The following is a list of key factors which need to be taken into account when planning to change the culture:

a) **Management commitment.** TQM and culture change require long-term planning and objectives. Any changes must be initiated by the CEO and his management team. However, it is often found that the *main obstacle is the leadership style*. The emphasis on culture should be on a highly flexible approach which is adaptive to a changing business environment.

b) **Organisation structure.** *Decentralisation and delegation of authority is vital.*

c) **Planning for change.** Senior and middle managers should be prepared to solve conflicts and surmount any resistance which is likely to be encountered among staff.

d) **Company-wide team activities,** such as training which stresses *leadership style* and communicating through the mechanism of briefing sessions on such issues like "Where are we?" and "Where will we be?" are crucial in changing culture.

e) **Skills and wills of staff.** This requires a programme of education and training; the main difficulty is the personal values of staff and their expectations.

f) **The CHINESE culture and that of HONG KONG people have to be taken into consideration when planning culture change.** There is a tendency for the Chinese people not being open in reflecting opinions and ideas. And worst, Hong Kong people are short-sighted, looking primarily for monetary rewards and direct benefits for themselves, particularly so in the months running up to June 1997. This is in contrast to culture change which is a much long-term process.

g) **Customers' needs, wants and expectations** should be fed back to the organisation to facilitate a culture orientated to quality and customer service. The culture has to be spread throughout the organisation with an urge for action and total involvement of all employees through commitment and participation in functions like research and development, operation, finance, personnel, training/ education, marketing and management information system.

6.3.5 Use of framework

The framework as outlined below can be used by the executive management of the organisation as part of a five-stage process:

1) The senior management team should consider the features of each section of the framework as described above; adjusting features to suit an individual organisation, its business, operating environment and country culture.

2) Assess features which are already in place within the organisation, using self-audit and customer surveys. A number of methods of assessments can be used, for example, rank each feature on a one to seven scale or employing a yes or no answer.

3) Prioritise the features which are not already in place in accordance with the overall strategy, business plans and commercial needs of the organisation. In undertaking this analysis there is no need to relate the prioritised features to the four sections of the framework.

4) Develop plans to introduce the prioritised features of the framework identified in the previous stage. The plans should have a start and finish date and should take into any other organisational initiatives which are already underway.

5) Identify any potential problems in putting the plans developed in (4) into place.

To conclude, quality improvement is a continuous and on-going process. This is true particularly in a competitive business environment where customers are becoming more and more demanding, and where change is the norm. What has been shown to be good and effective to-day may be out-of-date tomorrow. The ability to effectively and efficiently adapt and adjust to change often differentiates a good company from a bad one. Quite often such successful companies possess a clear and distinctive corporate culture that everyone of its employees believes in and relies upon.

7. CONCLUSION

Though the response rate of the survey is low, figures 10 to 13 show that the sample is a good representative of the manufacturing industries of Hong Kong in terms of types of industry, sizes of company, sources of capital and places of manufacturing. This forms a sound foundation on the representativeness of the conclusions which follow. These will be presented in the same manner as in section 5.1. In addition, some concluding remarks on the state-of-art of the TQM approach in Hong Kong Industries will be offered.

60.4 percent of the responding companies had a formal system to make and check the direction of their products; 41.7 percent had conducted courses to educate their customers; 60.9 percent were conscious of their legal obligations and liabilities; over 70 percent had a system to check that goods are delivered to the right customers, if customers are satisfied with the products and, whether deliveries are arriving on time; and, 88.5 percent used information from their sales forces or agents to recognise changes in customer needs. It is, therefore, concluded that the Core Concept CUSTOMER SATISFACTION is considered to be doing well.

57.7 percent of the responding companies used quality campaigns and 50 percent used economic reward to motivate their employees to perform according to quality goals; only 34.8 percent had a system to select their sales agents, and; 43.8 percent had an educational programme for their sales agents. It is concluded that the Core Concept INTERNAL CUSTOMER IS REAL is considered to be weak and needs a lot of changes and improvements. From these, it can be concluded that, generally, the

Governing Principle **Delight the Customer** is doing satisfactorily among the Hong Kong manufacturing industries.

80.8 percent of the responding companies possess QDs describing their quality policies about quality and quality control, with their major uses being for creating quality culture (95.2%), designing QC-training (92.9%) and quality planning by middle management (85.7%). Among those respondents possessing QDs, 92.9 percent had upgraded their QDs to quality handbooks; of the 29 valid cases, the average number of hours per year spent on educational and training activities per employee was 32.83 with a standard deviation of 27.38 hours which is low by any standards. 84.6 percent had a system to evaluate employees; 44.7 percent used test marketing; cluster analysis (40.4%), factor analysis (40.4%) and perceptual mapping (38.5%) being the techniques used by the marketing department to analyse information received; lot inspection (78.8%) being commonly used to check quality of suppliers. 83.3 percent used "Concept in Statistical Control" to check their production processes, and 62.7 percent used the concept A.O.Q., L.T.P.D. or similar concepts. It is concluded that the Core Concept MEASUREMENT is providing useful information for management to measure and monitor improvements.

96.2 percent of the responding companies defined the tasks of their employees through objectives of the management as expected traditionally; 83.7 percent used work standards (quotas) on the factory floor; 71.1 percent performed process capability studies and their uses being to select choice among alternatives processes (87.5%), to establish control limits (84.4%), to purchase machinery (81.3%), and to determine the economic aim of a process (78.1%), it is concluded that the Core Concept ALL WORK IS PROCESS is carried out and working effectively. From these, it can be

concluded that, generally, the Governing Principle **Management by Fact** is doing well among Hong Kong's manufacturing industries.

Of the 17 responding companies which have QCCs, 56.4 percent were from the production department and 34.9 percent were characterised as active and 51.2 percent as modestly active. 84 percent exchanged quality control technology and know-how with their suppliers. It is concluded that the Core Concept TEAMWORK is doing an excellent job externally with suppliers but doing poorly internally with the QCCs being concentrated primarily in production departments.

With participation in defining quality goals by top management (94.2%), by middle management (88.5%) and by main customers (46.2%); top management, quality department and production department being the top three ranked overall for participation in design review at various stages during development of new product; top management (75%), management of QC department (73.1%) and management of production (71.2%) being the top three most participated in regular audit in their own companies' department on quality control efforts and results; 98 percent of the responding companies supporting their employees to follow job relevant voluntary external courses; education/training (57.7%), standards or goals for the number of suggestions (38.5%), prizes and awards (36.5%) and bonus system (36.5%) being used to ensure employees are active in making suggestions, and; the result of formal evaluation being used to find candidates for promotion (73.1%), to decide on salary and wages (73.1%) and to start new education (61.5%), it is concluded that the Core Concept PEOPLE MAKE QUALITY is doing satisfactorily. From these, it can be concluded that the Governing Principle **People-Based Management** is doing very well among the Hong Kong manufacturing industries.

88 percent of the responding companies conduct regular audits in their departments on quality control efforts and results. Of the 17 responding companies, the average number of QCCs was 4.76, with a standard deviation of 5.18; 66.7 percent had systems to ensure that employees make suggestions about quality improvements. Written reports (75%), formal meetings (67.3%) and informal face to face meetings (53.8%) being the sources of information on quality problems used by management; those for employees being informal face to face meetings (55.8%), informal group meetings (55.8%) and formal meetings (48.1%). 78.7 percent used process control charts in production processes, and; 58.7 percent demanded that their suppliers use process control charts. It is concluded that the Core Concept CONTINUOUS IMPROVEMENT CYCLE is doing satisfactorily.

With customers, group discussion and design review being the top three methods ranked overall to identify latent quality problems during product development and the causes of quality problems after the development stage; 84 percent of the responding companies had formal systems to check the work of individual department. Quality evaluation (86.5%), price evaluation (82.7%) and delivery evaluation (76.9%) were the three kinds of information most frequently to evaluate suppliers. Quality problems caused by late deliveries were common (92%) but not serious (12%), and; 84.3 percent of the responding companies had systems for preventive maintenance of the production equipment. It is concluded that the Core Concept PREVENTION is doing satisfactorily. From these, it can be concluded that the Governing Principle **Continuous Improvement** is doing very well among Hong Kong's manufacturing industries.

Product quality (75%), product function (69.2%) and handling of complaints (57.7%) are considered by the responding companies as very

important competitive parameters. 88.5 percent specified quality goals when defining the tasks of an employee or a group of employees; 90.4 percent specified quality goals when defining tasks of an individual department; 75 percent used MBO where the objectives are numeric goals. Verbal instruction (92.3%), on the spot training (75%) and written job description (63.5%) are the three mostly used methods to communicate objectives to the employees; organised meetings with the salesforce (71.2%), seminars (48.1%) and informal meetings (42.3%) being the three most frequently used methods to inform the salesforce about new products and changes in existing products. 81.6 percent used the JIT principle when planning production, and 72 percent showed an interest, to different degrees, in ISO 9000 series certification. It is concluded that the Governing Principle **Leadership** is doing very well among Hong Kong's manufacturing industries. Results from the 1-way ANOVA (5.2.1) reveal that product quality, handling of complaints, product functions, market price, warranty and service after sale are more important than other competitive parameters. FACTOR ANALYSIS (5.2.2) reveals three underlying visions on competitive parameters had by management:

1. **management vision** on *quality aspects aimed at meeting customer satisfaction* (**factor 1**);
2. **management vision** on *better service and promotion* (**factor 2**);
3. **management vision** on *better choice available to customers* (**factor 3**).

It is also concluded that source of capital is independent of use of quality document (5.2.3), methods used to communicate objectives to employees (5.2.4), ways to ensure employees suggestions (5.2.5) and use of formal evaluation (5.2.6); use of quality document is independent of participation in defining quality goals (5.2.7), participation in the audit

(5.2.8) and desire for ISO 9000 (5.2.9), and; participation in the audit and participation in defining quality goals are independent.

In conclusion, the Five Governing Principles and the Eight Core Concepts can be adequately used to describe the **total quality management approach for the Hong Kong Industries**. Hence, the cultural model of TQM developed in section 3.2 (page 56) fits in well in the Hong Kong context with the cultural aspect being imbedded in the Eight Core Concepts.

From the two case studies, it is found that the common pitfalls encountered in both companies are the **lack of** *management commitment*, the **lack of** *proper training*, the **lack of** *involvement of staff* and the **resistance to change** *from performance through management to performance through people*.

With the growing involvement of China in world trade, the change of industrial infrastructure of Hong Kong from a manufacturing-oriented to a service-oriented industry and the growing concern of the "**Voice of Customer**", the author suggests the following areas for further research:

1. TQM in the non-market economies (e.g. China).
2. TQM in the service industries.
3. TQM in the professional sector (e.g. legal, medical).
4. Quality Function Deployment.

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致：工業總會會員
敬啓者，

全面品質管理調查

這是一項有關香港製造業的全面品質管理調查，也是屬於品質及經濟發展計劃全球性調查的一部份。這次調查目的是收集一些製造業內人仕所採用的品質管理方法和原則。 而香港工業總會全體會員是被納入為調查對象。

問卷內有問題五十七條，敬請費心把問卷填妥及寄回，所有資料將予以保密。 如有任何諮詢請電5722226內線250－252。 另調查報告完成後可供索取。

多謝合作

管理學系講師
廖俊傑
敬上
一九九四年三月二十一日

To: Members of the Federation of Hong Kong Industries

March 21, 1994.

Dear Sir,

Re: Survey on TOTAL QUALITY MANAGEMENT

I am conducting a survey on the Total Quality Managerment in the manufacturing industry of Hong Kong, which contributes as part of the world survey initiated by the Quality and Economic Development project in Europe. The aim of this survey is to collect information about the relative uses of various quality control methods and principles. All members of the Federation of Hong Kong Industries are included in this study.

The questionnaire contains 57 questions. Please fill in the questionnaire as far as you possibly can. All information will be treated with strict confidence. If you have any queries, please feel free to contact me at 5722226 ext. 250-252. Survey report will be available on request.

Thank you for your co-operation.

Yours sincerely,

C.K.Liu

Mr. Liu Chun Kit
Lecturer
Department of Management

1．公司名稱：
NAME OF COMPANY ：_____

聯絡人姓名：
CONTACT PERSON：_____

聯絡人職銜：
JOB TITLE ：_____

聯絡電話：
CONTACT TEL. NO.：_____

2．公司規模
SIZE OF COMPANY

在下列各年度之全職員工人數、營業總額及資產總額分別為：
FOR THE FOLLOWING YEARS, TOTAL NO. OF EMPLOYEES, TOTAL TURNOVER AND TOTAL ASSETS ARE：

	員工人數 NO. OF EMPLOYEES	營業總額（港幣） TURNOVER (HK$)	資產總額（港幣） ASSETS (HK$)
1988：	_____	_____	_____
1989：	_____	_____	_____
1990：	_____	_____	_____
1991：	_____	_____	_____
1992：	_____	_____	_____

3．資金來源
SOURCES OF CAPITAL

1_____中資 CHINA　2_____美資 U.S.A.　3_____英資 BRITAIN　4_____日資 JAPAN

5_____港資 HONG KONG　6_____其他外資請註明：OTHERS PLEASE SPECIFY:_____

7_____合資，JOINT VENTURE, PLEASE SPECIFY COUNTRIES:_____
請註明國家：

及資本比例：
AND THEIR PROPORTIONS:_____

4．試估下列競爭產品佔營業總額的百分比：
ESTIMATE THE PERCENTAGE OF THE TURNOVER WHICH IS FROM:

a）顧客認為　貴公司優於競爭對手的產品（或服務）佔
PRODUCTS OR SERVICES WHICH THE CUSTOMERS EVALUATE AS SUPERIOR TO THE COMPETITORS' PRODUCTS：_____%

b) 顧客認為 貴公司劣於競爭對手的產品（或服務）佔
PRODUCTS OR SERVICES WHICH THE CUSTOMERS EVALUATE AS INFERIOR TO THE COMPETITORS' PRODUCTS : _____ %

c) 顧客認為 貴公司與競爭對手相同品質的產品（或服務）佔
PRODUCTS OR SERVICES WHICH THE CUSTOMERS EVALUATE AS EQUAL IN QUALITY COMPARED TO THE COMPETITORS' PRODUCTS : _____ %

5. 工業類別
TYPE OF INDUSTRY

請寫出 貴公司最主要的三種產品及其生產地：
PLEASE INDICATE THE 3 MAIN PRODUCTS OF YOUR COMPANY & THEIR PLACES OF MANUFACTURING :

	產品 PRODUCT	產地 PLACE OF MANUFACTURING		
a)	_____	1 香港 HONG KONG	2 中國 CHINA	3 其他 OTHERS _____
b)	_____	1 香港 HONG KONG	2 中國 CHINA	3 其他 OTHERS _____
c)	_____	1 香港 HONG KONG	2 中國 CHINA	3 其他 OTHERS _____

6. 請問 貴公司對下列各競爭因素的看法如何？
HOW DO YOU CONSIDER THE IMPORTANCE OF COMPETITIVE PARAMETERS FOR THE COMPANY?

(每小題請單選) (ONE X IN EACH ROW)	毫不重要 IRRELEVANT	不重要 UN-IMPORTANT	略為重要 MODESTLY IMPORTANT	頗為重要 RATHER IMPORTANT	非常重要 VERY IMPORTANT
a. 市場價格 MARKET PRICE	1	2	3	4	5
b. 產品品質 PRODUCT QUALITY	1	2	3	4	5
c. 產品運送 DELIVERY	1	2	3	4	5
d. 廣　告 ADVERTISING	1	2	3	4	5
e. 售前服務 SERVICE BEFORE SALE	1	2	3	4	5
f. 售後服務 SERVICE AFTER SALE	1	2	3	4	5
g. 貨色齊全 ASSORTMENT	1	2	3	4	5

(每小題請單選) (ONE X IN EACH ROW)	毫不重要 IRRELEVANT	不重要 UN- IMPORTANT	略為重要 MODESTLY IMPORTANT	頗為重要 RATHER IMPORTANT	非常重要 VERY IMPORTANT
h. 產品保證 WARRANTY	1_____	2_____	3_____	4_____	5_____
i. 投訴處理 HANDLING OF COMPLAINTS	1_____	2_____	3_____	4_____	5_____
j. 產品功能 PRODUCT FUNCTIONS	1_____	2_____	3_____	4_____	5_____

7. 請問 貴公司是否有關於品質政策或品質管制的文件？
DO YOU HAVE A QUALITY DOCUMENT DESCRIBING YOUR COMPANY'S POLICY ABOUT QUALITY AND QUALITY CONTROL?

有	沒有
1_____YES	2_____NO

8. 若上題的答案為"有"，請問 貴公司如何使用該等文件？
IF YES: HOW DO YOU USE YOUR QUALITY DOCUMENT?

	是 YES	否 NO
a. 該等文件僅作為高層管理者決定品質策略之用 THE QD IS USED ONLY BY TOP MANAGEMENT WHEN DECIDING ON QUALITY STRATEGY	1____	2____
b. 該等文件由中層管理者作品質規劃之用 THE QD IS USED BY MIDDLE MANAGEMENT IN QUALITY PLANNING	1____	2____
c. 該等文件並不傳達給全體員工 THE QD IS NOT COMMUNICATED TO ALL EMPLOYEES	1____	2____
d. 該等文件時時傳達給全體員工 THE QD IS CONTINUOUSLY COMUNICATED TO ALL EMPOLYEES	1____	2____
e. 該等文件是品質管制訓練的一項重要成份 THE QD IS AN IMPORTANT INPUT FOR DESIGNING QC-TRAINING	1____	2____
f. 該等文件是創造品質文化的一項重要因素 THE QD IS AN IMPORTANT FACTOR FOR CREATING QUALITY CULTURE	1____	2____
g. 所有藍領階級員工都認識該等品質文件 ALL BLUE COLLAR WORKERS KNOW THE QD	1____	2____

9. 請問 貴公司是否備有品質手冊？(有關於品質程序之手冊)
DO YOU HAVE A QUALITY HANDBOOK? (A WRITTEN DOCUMENTATION OF QUALITY PROCEDURES)

有	沒有
1_____YES	2_____NO

10. 那些人參與制訂品質目標？
WHO PARTICIPATE IN DEFINING YOUR QUALITY GOALS?

	有/YES	沒有/NO
a. 高層管理者 TOP MANAGEMENT	1_____	2_____
b. 中層管理者 MIDDLE MANAGEMENT	1_____	2_____
c. 主要客戶 MAIN CUSTOMERS	1_____	2_____

其他／OTHERS: _____

11. 在新產品開發期間，那些部門參與品質之設計審查？
WHICH DEPARTMENTS PARTICIPATE IN DESIGN REVIEW DURING DEVELOPMENT OF NEW PRODUCTS?

部門 DEPARTMENT	參與設計審查之階段／TYPE OF DESIGN REVIEW					
	預備階段/PRELIMINARY		期中階段/INTERMEDIATE		最後階段/FINAL	
	有/YES	沒有/NO	有/YES	沒有/NO	有/YES	沒有/NO
a. 研發部門 R & D DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
b. 生產規劃部門 PRODUCTION PLANNING	1_____	2_____	1_____	2_____	1_____	2_____
c. 採購部門 PURCHASING DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
d. 生產部門 PRODUCTION DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
e. 銷售部門 SALES DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
f. 行銷部門 MARKETING DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
g. 品管部門 QUALITY DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
h. 高層管理者 TOP MANAGEMENT	1_____	2_____	1_____	2_____	1_____	2_____
i. 財務部門 FINANCE DEPARTMENT	1_____	2_____	1_____	2_____	1_____	2_____
j. 主要客戶 MAIN CUSTOMERS	1_____	2_____	1_____	2_____	1_____	2_____

其他／OTHERS: _____

12. 請問 貴公司在產品開發期間有否利用下列方法來發掘一些潛在的品質問題？
WHICH METHODS DO YOU USE DURING PRODUCT DEVELOPMENT TO IDENTIFY LATENT QUALITY PROBLEMS? (LATENT FAILURES WHICH WILL BE DISCOVERED BY YOUR INTERNAL OR EXTERNAL CUSTOMERS)

	有/YES	沒有/NO
a. 因果圖 CAUSE AND EFFECT DIAGRAMS	1_____	2_____
b. 群體討論法 GROUP DISCUSSIONS	1_____	2_____
c. 品質功能應用法 QUALITY FUNCTION DEPLOYMENT	1_____	2_____
d. 實驗控制法 CONTROLLED EXPERIMENTS	1_____	2_____
e. 可靠度分析 RELIABILITY ANALYSIS	1_____	2_____
f. 產品壽命測試 LIFE TIME TESTING	1_____	2_____
g. 設計審查法 DESIGN REVIEW	1_____	2_____
h. 客戶反應 CUSTOMERS	1_____	2_____

其他／OTHERS：_____

13. 請問 貴公司在產品開發完成後，有否利用下列方法來發掘一些有關品質問題的原因？
WHICH METHODS DO YOU USE TO IDENTIFY CAUSES OF QUALITY PROBLEMS (FAILURES) AFTER DEVELOPMENT STAGE?

	有/YES	沒有/NO
a. 因果圖 CAUSE AND EFFECT DIAGRAMS	1_____	2_____
b. 群體討論法 GROUP DISCUSSIONS	1_____	2_____
c. 品質功能應用法 QUALITY FUNCTION DEPLOYMENT	1_____	2_____
d. 實驗控制法 CONTROLLED EXPERIMENTS	1_____	2_____
e. 可靠度分析 RELIABILITY ANALYSIS	1_____	2_____
f. 產品壽命測試 LIFE TIME TESTING	1_____	2_____

	有/YES	沒有/NO
g. 設計審查法 DESIGN REVIEW	1_____	2_____
h. 客戶反應 CUSTOMERS	1_____	2_____

其他／OTHERS：_____

14. 請問　貴公司是否有定期審查品質管制的成效？
DO YOU HAVE REGULAR AUDITS IN YOUR COMPANY'S DEPARTMENTS (AT LEAST YEARLY) OF YOUR QUALITY CONTROL EFFORTS AND RESULTS?

有	沒有
1_____YES	2_____NO

15. 若上題答案為“有”，則請問下列人物有否參與審查？
IF YES: WHO PARTICIPATES IN THE AUDIT?

	有/YES	沒有/NO
a. 高層管理者 TOP MANAGEMENT	1_____	2_____
b. 生產部門管理者（如：部門經理） MANAGEMENT OF THE PRODUCTION DEPARTMENT	1_____	2_____
c. 生產部門之中級管理者（如：科長） MIDDLE MANAGEMENT OF THE PRODUCTION DEPARTMENT	1_____	2_____
d. 所有生產部門之員工 ALL OTHER EMPLOYEES OF THE PRODUCTION DEPARTMENT	1_____	2_____
e. 品管部門管理者 MANAGEMENT OF QC DEPARTMENT	1_____	2_____
f. 其他的部門管理者 MANAGEMENT OF OTHER DEPARTMENT	1_____	2_____

其他／OTHERS：_____

16. 請問　貴公司是否有正式制度來檢查各部門的工作？（請選一個）
DO YOU HAVE FORMAL SYSTEMS TO CHECK THE WORK OF THE INDIVIDUAL DEPARTMENT? (ONE X ONLY)

有的，各部門都有
1_____YES, IN ALL DEPARTMENT

有的，但只在某些部門裡有
2_____YES, IN SOME DEPARTMENT

沒有
3_____NO

17. 在界定某一員工或某一群員工之工作時，請問有沒有訂定其工作之品質目標？（請選一個）
WHEN DEFINING THE TASKS OF AN EMPLOYEE, OR A GROUP OF EMPLOYEES, ARE QUALITY GOALS SPECIFIED? (ONE X ONLY)

有，常有指定的品質目標
1_____YES, ALWAYS SPECIFIC QUALITY GOALS

有，常有一般的品質目標
2_____YES, ALWAYS GENERAL QUALITY GOALS

有，有時指定的有時是一般的品質目標
3_____YES, SOMETIMES SPECIFIC SOMETIMES GENERAL QUALITY GOALS

沒有品質目標
4_____NO, DO NOT SPECIFY QUALITY GOALS

18. 在界定一個部門的工作時，請問有沒有訂定其工作之品質目標？（請選一個）
WHEN DEFINING THE TASKS OF AN INDIVIDUAL DEPARTMENT, ARE QUALITY GOALS SPECIFIED? (ONE X ONLY)

有，常有指定的品質目標
1_____YES, ALWAYS SPECIFIC QUALITY GOALS

有，常有一般的品質目標
2_____YES, ALWAYS GENERAL QUALITY GOALS

有，有時指定的有時是一般的品質目標
3_____YES, SOMETIMES SPECIFIC SOMETIMES GENERAL QUALITY GOALS

沒有品質目標
4_____NO, DO NOT SPECIFY QUALITY GOALS

19. 請問 貴公司如何界定一個員工的工作？
HOW ARE THE TASKS OF AN EMPLOYEE IN THE COMPANY DEFINED?

	是/YES	否/NO
a. 由管理者界定 THROUGH OBJECTIVES DEFINED BY MANAGER	1_____	2_____
b. 由員工本人界定 THROUGH OBJECTIVES DEFINED BY THE EMPLOYEE HIMSELF	1_____	2_____
c. 由一群員工界定 THROUGH OBJECTIVES DEFINED BY A GROUP OF EMPLOYEES	1_____	2_____

其他／OTHERS: _____

20. 請問 貴公司在工作現場有否實施工作標準（如工作進度）？
DO YOU USE WORK STANDARDS (QUOTAS) ON THE FACTORY FLOOR?

有 1_____YES　　沒有 2_____NO

21. 請問 貴公司有否利用"目標管理"的觀念？(該目標是數量化的目標)
DO YOU USE THE CONCEPT 'MANAGEMENT BY OBJECTIVE' WHERE THE OBJECTIVES ARE NUMERIC GOALS?

有	沒有
1_____YES	2_____NO

22. 請問 貴公司是否透過以下方式與員工傳遞目標？
HOW ARE THE OBJECTIVES COMMUNICATED TO THE EMPLOYEES?

	是/YES	否/NO
a. 透過操作指導手冊 THROUGH OPERATIONAL INSTRUCTION MANUAL	1_____	2_____
b. 透過視覺教導 THROUGH VISUAL INSTRUCTION	1_____	2_____
c. 透過口頭教導 THROUGH VERBAL INSTRUCTION	1_____	2_____
d. 透過現場實地訓練 THROUGH ON THE SPOT TRAINING	1_____	2_____
e. 透過書面的工作描述 THROUGH A WRITTEN JOB DESCRIPTION	1_____	2_____

其他／OTHERS: _____

23. 每年每位員工參加學習及培訓活動的時間是多少？
HOW MANY HOURS PER YEAR ARE USED FOR EDUCATIONAL AND TRAINING ACTIVITIES PER EMPLOYEE?

每年大約是 APPROXIMATELY _____ 小時 HOURS PER YEAR

24. 請問 貴公司是否支持員工自願參加外界舉辦的有關工作上之課程？ (請選一個)
DOES THE COMPANY SUPPORT EMPLOYEES WHO WANT TO FOLLOW JOB RELEVANT VOLUNTARY EXTERNAL COURSES? (ONE X ONLY)

是，經常支持
1_____ALWAYS

是，有時候會支持
2_____SOMETIMES

從不支持
3_____NEVER

25. 請問　貴公司如何激勵員工以達到品質目標？
HOW DO YOU MOTIVATE YOUR EMPLOYEES TO PERFORM ACCORDING TO QUALITY GOALS?

	是/YES	否/NO
a. 達到高品質目標時給紅利 BONUS FOR HIGH QUALITY	1_____	2_____
b. 透過品質宣傳活動 QUALITY CAMPAIGNS	1_____	2_____
c. 給與實質報酬 ECONOMIC REWARD	1_____	2_____
d. 透過品管圈活動 QUALITY CONTROL CIRCLE ACTIVITIES	1_____	2_____
e. 工作輪調 JOB ROTATION	1_____	2_____

其他／OTHERS: _____

26. 請問　貴公司的品質圈數目有多少？
WHAT IS THE NUMBER OF QUALITY CIRCLES IN YOUR COMPANY? _____

27. 請問　貴公司參與品質圈活動之員工比例有多少？
WHAT IS THE SHARE OF EMPLOYEES IN YOUR COMPANY, WHO PARTICIPATE IN QUALITY CONTROL CIRCLE ACTIVITIES?

生產部門 PRODUCTION	%
其他部門 OTHER DEPARTMENT	%
	100%

28. 請問　貴公司的品質圈活動情形的百分比：
HOW LARGE A SHARE OF YOUR QCC'S WOULD YOU CHARACTERIZE AS:

非常積極的佔 ACTIVE	%
積極的佔 MODESTLY ACTIVE	%
令人想睡的佔 SLEEPING	%
	100%

29. 請問　貴公司是否有一套辦法可以讓員工提出對品質改進的建議？
DO YOU HAVE A SYSTEM TO ENSURE THAT THE EMPLOYEES MAKE SUGGESTIONS ABOUT QUALITY IMPROVEMENTS?

有	沒有
1_____YES	2_____NO

30. 若上題答案為"有"，則請問　貴公司是否接受這些建議？（請選一個）
IF YES: DO YOU ACCEPT? (ONE X ONLY)

1_____僅接受個人之建議 INDIVIDUAL SUGGESTIONS ONLY

2_____僅接受團體之建議 GROUP SUGGESTIONS ONLY

3_____以上兩者都接受 BOTH

31. 請問　貴公司如何使員工積極地提出品質改進的建議？
HOW DO YOU ENSURE THE EMPLOYEES ARE ACTIVE IN MAKING SUGGESTIONS?

	是/YES	否/NO
a. 金錢上的報酬 MONETARY REWARDS	1_____	2_____
b. 將建議的數量訂成指標或標準 STANDARDS OR GOALS FOR THE NUMBER OF SUGGESTIONS	1_____	2_____
c. 授與獎金、獎品或獎狀 PRIZES AND AWARDS	1_____	2_____
d. 透過比賽 COMPETITIONS	1_____	2_____
e. 透過培訓或訓練 EDUCATION/TRAINING	1_____	2_____
f. 透過紅利制度 BONUS SYSTEMS	1_____	2_____

其他／OTHER:_____

32. 請問　貴公司是否有一套制度來評估員工？
DO YOU HAVE A SYSTEM TO EVALUATE THE EMPLOYEES?

有	沒有
1_____YES	2_____NO

33. 若上題答案為"有"，則請問 貴公司是否利用評估的結果來
IF YES: WHAT ARE YOU USING THE FORMAL EVALUATION TO

	是/YES	否/NO
a. 解雇不合適的員工？ DISMISS UNQUALIFIED PERSONS?	1_____	2_____
b. 晉升合適的員工？ FIND CANDIDATES FOR PROMOTION?	1_____	2_____
c. 釐定員工之薪酬或津貼？ DECIDE ON SALARY AND WAGES?	1_____	2_____
d. 開展新培訓計劃？ START NEW EDUCATION?	1_____	2_____
e. 將有關員工調職？ ROTATE PEOPLE?	1_____	2_____

其他／OTHERS: _____

34. 請問. 貴公司的管理階層和員工如何得悉品質出了問題？ (每小題可選一至五個)
HOW IS INFORMATION ON QUALITY PROBLEMS OBTAINED? (1 TO 5 X IN EACH ROW)

	非正式的面對面討論 INFORMAL FACE TO FACE MEETINGS	非正式的群體討論 INFORMAL GROUP MEETINGS	書面報告 WRITTEN REPORTS	正式會議 FORMAL MEETINGS	透過建議途徑 SUGGESTION SYSTEMS	其他 (請描述) OTHERS (PLEASE SPECIFY)
管理階層 MANAGEMENT	_____	_____	_____	_____	_____	_____
員工 EMPLOYEES	_____	_____	_____	_____	_____	_____

35. 請問 貴公司如何向銷售人員傳達有關新產品或改變既有產品之訊息？
HOW DO YOU INFORM THE SALEFORCE ABOUT NEW PRODUCTS AND CHANGE IN EXISTING PRODUCTS?

	是/YES	否/NO
a. 不會傳達 DO NOT INFORM	1_____	2_____
b. 與銷售人員開會討論 ORGANIZED MEETINGS WITH THE SALEFORCE	1_____	2_____
c. 透過研討會 SEMINARS	1_____	2_____
d. 透過小冊子 BROCHURES	1_____	2_____
e. 透過非正式討論 INFORMAL MEETINGS	1_____	2_____

其他／OTHERS: _____

36. 請問 貴公司是否有一套挑選經銷商之制度？
DO YOU HAVE A SYSTEM TO SELECT SALES AGENTS?

1_____有 YES

2_____沒有，但我們已有銷售代理商了 NO, BUT WE HAVE SALES AGENTS

3_____沒有，我們不用銷售代理商 NO, WE DO NOT HAVE SALES AGENTS

37. 請問 貴公司是否有一套正式制度來編訂或核對 貴公司產品的使用說明書？
DO YOU HAVE A FORMAL SYSTEM TO MAKE AND CHECK DIRECTIONS FOR YOUR PRODUCTS?

1_____有 YES　　2_____沒有 NO

38. 請問 貴公司是否有培訓客戶的課程？
DO YOU HAVE COURSES TO EDUCATE YOUR CUSTOMERS?

1_____有 YES　　2_____沒有 NO

39. 請問 貴公司是否有一套培訓代理商的課程？
DO YOU HAVE AN EDUCATIONAL PROGRAMME FOR YOUR SALES AGENTS?

1_____有 YES　　2_____沒有 NO

40. 請問 貴公司是否使用市場試銷的技術？
DO YOU USE TEST MARKETING?

1_____是 YES　　2_____否 NO

41. 請問 貴公司是否有檢核銷售及行銷活動是否合法的制度？
DO YOU HAVE A SYSTEM TO CHECK THE LEGAL ASPECTS OF YOUR SALES AND MARKETING ACTIVITIES?

1_____有 YES　　2_____沒有 NO

42. 請問 貴公司是否設有考察下列項目的制度？
DO YOU HAVE A SYSTEM TO CHECK THE FOLLOWING ITEMS?

	有/YES	沒有/NO
a. 客戶是否滿意 貴公司的產品 IF THE CUSTOMERS ARE SATISFIED WITH THE PRODUCTS	1_____	2_____
b. 貨品是否正確地送到客戶的手中 THAT YOU ARE DELIVERING THE GOODS TO THE RIGHT CUSTOMERS	1_____	2_____

	有/YES	沒有/NO
c. 代理商是否遵照 貴公司的規定 THAT YOUR SALES AGENTS ARE DOING WHAT THEY ARE INSTRUCTED	1_____	2_____
d. 銷售人員是否達到標準 WHETHER THE SALES PEOPLE ARE LIVING UP TO STANDARD	1_____	2_____
e. 貨品是否準時送達 WHETHER YOUR DELIVERIES ARE ARRIVING ON TIME	1_____	2_____
f. 其他有關品質的事項 OTHER QUALITY MATTERS	1_____	2_____

請註明/PLEASE SPECIFY:_____

43. 請問 貴公司如何意識到客戶需求之改變？
HOW DO YOU RECOGNIZE CHANGES IN CUSTOMER NEEDS?

	是/YES	否/NO
a. 從銷售人員或代理商得到資訊 INFORMATION FROM THE SALES FORCE OR AGENTS	1_____	2_____
b. 透過例行的市場調查 SYSTEMATIC MARKET PANELS OR SURVEYS	1_____	2_____
c. 透過特別的調查 AD HOC PANELS OR SURVEYS	1_____	2_____

其他／OTHERS: _____

44. 請問 貴公司行銷部門利用何種技術來分析回收的資料？
WHAT TECHNIQUES DO THE MARKETING DEPARTMENT USE TO ANALYSE THE RECEIVED INFORMATION?

	是/YES	否/NO
a. 集群分析 CLUSTER ANALYSIS	1_____	2_____
b. 因素分析 FACTOR ANALYSIS	1_____	2_____
c. 多元尺度法 MULTIDIMENSIONAL SCALING	1_____	2_____
d. 知覺上的感應 PERCEPTUAL MAPPING	1_____	2_____
e. 其他技術 OTHER TECHNIQUES	1_____	2_____

請註明/PLEASE SPECIFY:_____

45. 在計劃生產時是否利用“及時原則”？（請選一個）
DO YOU USE THE JUST-IN-TIME PRINCIPLE WHEN PLANNING PRODUCTION? (ONE X ONLY)

是，經常利用
1_____YES, ALWAYS

是，偶而利用
2_____YES, SOMETIMES

從沒有
3_____NEVER

46. 請問 貴公司是否作製程能力研究？
DO YOU PERFORM PROCESS CAPABILITY STUDIES?

有 YES 1_____ 沒有 NO 2_____

47. 若上題答案為“有”，請問 貴公司如何利用該研究結果？
IF YES: HOW DO YOU UTILIZE THE RESULTS OF PROCESS CAPABILITY STUDIES?

應用範圍/APPLICATION	是/YES	否/NO
a. 從各種可行的製程中挑選 CHOICE AMONG ALTERNATIVE PROCESSES	1_____	2_____
b. 購買機器 PURCHASE OF MACHINERY	1_____	2_____
c. 挑選工人 SELECTION OF WORKERS	1_____	2_____
d. 決定製程的經濟效益 DETERMINING THE ECONOMIC AIM OF A PROCESS	1_____	2_____
e. 建立管制界限 ESTABLISHING CONTROL LIMITS	1_____	2_____

其他／OTHERS: _____

48. 在 貴公司的生產過程中是否使用製程管制圖？（請選一個）
DO YOU USE PROCESS CONTROL CHARTS IN YOUR OWN PRODUCTION PROCESSES? (ONE X ONLY)

有，經常使用
1_____YES, ALWAYS

有，偶而使用
2_____YES, SOMETIMES

從不使用
3_____NEVER

49. 請問 貴公司是否要求供應商也使用製程管制圖？（請選一個）
DO YOU DEMAND THAT YOUR SUPPLIERS USE PROCESS CONTROL CHARTS? (ONE X ONLY)

有，經常要求
1_____YES, ALWAYS

有，僅在某些重要的批貨才要求
2_____YES, FOR CRITICAL DELIVERIES (LOTS)

從不要求
3_____NEVER

50. 請問 貴公司如何檢驗供應商的品質？
HOW DO YOU CHECK THE QUALITY OF YOUR SUPPLIERS?

	是/YES	否/NO
a. 利用批量檢驗 BY LOT INSPECTION	1_____	2_____
b. 分析供應商的品質管制圖 ANALYSING CONTROL CHARTS FROM YOUR SUPPLIERS	1_____	2_____
c. 檢查供應商的製程能力指標 CHECKING THE PROCESS CAPABILITY INDEX FROM YOUR SUPPLIERS	1_____	2_____
d. 在公司製造過程中檢查 CHECKING IS DONE IN YOUR PRODUCTION PROCESSES	1_____	2_____

51. 在檢查製程時，是否應用統計管制的觀念？（請選一個）
DO YOU USE THE "CONCEPT IN STATISTICAL CONTROL" WHEN CHECKING YOUR PRODUCTION PROCESSES? (ONE X ONLY)

是，經常應用
1_____YES, ALWAYS

是，偶而應用
2_____YES, SOMETIMES

從不應用
3_____NEVER

不知有此觀念
4_____DO NOT KNOW THIS CONCEPT

52. 請問 貴公司根據何種資訊評估供應商？
WHAT KIND OF INFORMATION DO YOU USE, WHEN YOU EVALUATE YOUR SUPPLIERS?

	是/YES	否/NO
a. 經濟效益評估 ECONOMIC EVALUATION	1_____	2_____
b. 品質評估 QUALITY EVALUATION	1_____	2_____

	是/YES	否/NO
c. 價格評估 PRICE EVALUATION	1_____	2_____
d. 運送評估 DELIVERY EVALUATION	1_____	2_____
e. 不需任何評估 NO EVALUATION	1_____	2_____

53. 請問 貴公司是否將品管技術或訣竅與供應商交流？ (請選一個)
DO YOU EXCHANGE QUALITY CONTROL TECHNOLOGY AND KNOW-HOW WITH YOUR SUPPLIERS? (ONE X ONLY)

1_____是，經常交流 YES, ALWAYS

2_____是，偶而交流 YES, SOMETIMES

3_____從不交流 NEVER

54. 請問 貴公司是否曾因供應商之運送延誤而造成品質上的問題？ (請選一個)
DO YOU HAVE QUALITY PROBLEMS CAUSED BY LATE DELIVERIES FROM YOUR SUPPLIERS? (ONE X ONLY)

1_____是，經常發生 YES, ALWAYS

2_____是，每月總發生幾次 YES, SEVERAL TIMES PER MONTH

3_____是，偶而發生 YES, SOMETIMES

4_____是，很少發生 YES, BUT SELDOM

5_____從不發生 NEVER

55. 請問 貴公司對生產設備是否有一套預防性維修系統？
DOES THE COMPANY HAVE A SYSTEM FOR PREVENTIVE MAINTENANCE OF THE PRODUCTION EQUIPMENT?

1_____有 YES　　2_____沒有 NO

56. 請問 貴公司是否使用“平均出廠品質”，“批不良率之容忍度”或相似的觀念？ (請選一個)
DO YOU USE THE CONCEPT "AVERAGE OUTGOING QUALITY" (A.O.Q.),
"LOT TOLERANCE PERCENTAGE DEFECTIVE" (L.T.P.D.) OR SIMILAR CONCEPTS? (ONE X ONLY)

1_____有 YES　　2_____沒有 NO　　3_____不知道有這些觀念 DON'T KNOW

57. 請問 貴公司對領取國際標準化組織品質系統證書（ISO 9000）是否甚有所需？（請選一個）
IS THE ISO 9000 SERIES CERTIFICATION DESIRED BY YOUR COMPANY? (ONE X ONLY)

是，證書已成功取得
1_____YES, CERTIFICATION SUCCESSFULLY OBTAINED

是，證書現正申領中
2_____YES, CERTIFICATION IN PROGRESS

是，甚有需要申請證書
3_____YES, CERTIFICATION DESIRED

否，沒有需要申請證書
4_____NO, CERTIFICATION NOT DESIRED

不知道有這回事
5_____DON'T KNOW

— 問卷完，多謝合作 —
- - END OF QUESTIONNAIRE, THANK YOU - -

調查結果將在月內完成。 閣下如欲索取調查報告，請把下列資料填妥。

A SURVEY REPORT WILL BE COMPILED IN DUE COURSE. IF YOU WANT TO REQUEST FOR A COPY OF THE REPORT, PLEASE GIVE DETAILS BELOW.

姓名：
NAME: _____

職銜：
JOB TITLE:_____

公司名稱：
NAME OF COMPANY:_____

公司地址：
ADDRESS OF COMPANY: _____

_____

_____

QUESTIONNAIRE Ref no.:

The purpose of this survey is to identify the current stage of TQM implementation inside the 2 selected companies -- SKF China Ltd. & Wo Kee Services Limited and the main barriers faced by the 2 companies during the implementation process.

1. What is the degree of commitment to quality for the following levels of management in your company organization?

   1.1 Top management

   [ ] very high [ ] high [ ] medium
   [ ] low [ ] very low [ ] no commitment at all

   1.2 Middle management

   [ ] very high [ ] high [ ] medium
   [ ] low [ ] very low [ ] no commitment at all

   1.3 Lower management

   [ ] very high [ ] high [ ] medium
   [ ] low [ ] very low [ ] no commitment at all

   1.4 Ordinary staff members

   [ ] very high [ ] high [ ] medium
   [ ] low [ ] very low [ ] no commitment at all

2. Has management made known their quality objectives and policy to all staff?

   [ ] Yes [ ] No
   If yes, please specify by what method _____

3. How many Quality Circles (QCs) or Work Improvement Teams (WIT), does your company have?

   _____ teams

4. How many people are involved in the QC or WIT in your company?

_____ people

5. Do you agree that all employees in your company have high quality awareness?

[ ] agree [ ] slightly agree [ ] neutral
[ ] slightly disagree [ ] disagree

6. Does your company have any recognition or reward for staff with good achievements in quality management activities?

[ ] Nil [ ] Recognition only [ ] Reward only
[ ] Both recognition and reward
[ ] Others, please specify _____

7. Does your company have any in-house quality management training?

[ ] Yes, for all staff [ ] Yes, for selected staff [ ] No
If yes, please specify _____

8. Does your company use any external quality management training facilities?

[ ] Yes [ ] No
If yes, please specify _____

9. In your opinion, which of the following training topics are important to the quality management drive in my organization: (You may tick more than one)

[ ] ISO 9000 awareness

[ ] ISO 9000 documentation / implementation

[ ] QCC concepts

[ ] General management / supervisory programmes

[ ] Basic concept of total quality management

[ ] Proposal writing

[ ] Problem identification / solution

[ ] Leadership skills

[ ] Quality concepts / awareness

[ ] Quality assurance

[ ] Team-building

[ ] Others, please specify _____

10. Does your company have measurement on quality costs as management tool?

[ ] Yes [ ] No
If yes, please specify _____

11. How often does your company meet your customers' requirements or expectations in terms of ..... ?

11.1 delivery / schedule

[ ] Always [ ] Sometimes [ ] Seldom

11.2 specification

[ ] Always [ ] Sometimes [ ] Seldom

11.3 after-sales service or customer supports

[ ] Always [ ] Sometimes [ ] Seldom

12. What the statistical process control does your company employ?

_____

13. In your company, are quality data regularly recorded and analyzed for corrective action or for quality improvement?

[ ] Yes [ ] No

Using the rating scale given below, please rate, for each of the following barriers, the degree of influence on the implementation of quality management system that you consider or have experienced in your company.

most influential least influential
1 ..... 2 ..... 3 ..... 4 5

[ ] Lack of clear quality vision, directions, objectives & policy

[ ] Lack of top management commitment through action and participation

[ ] Lack of middle management commitment through action

[ ] Lack of commitment and involvement of all employees

[ ] Lack of confidence in quality program of all employees

[ ] Lack of determination in quality program of all employees

[ ] Lack of expertise in quality management

[ ] Lack of leadership

[ ] Lack of work standards, procedure or guidelines

[ ] Lack of clear responsibility and authority

[ ] Lack of quality training and education

[ ] Lack of motivation

[ ] Resistance to change

[ ] Ineffective communication and feedback system

[ ] Office politics

[ ] Improper or ineffective organizational structure

[ ] High workload

[ ] Lack of planning, monitoring and controlling

[ ] No consensus on the quality concepts e.g. "Right first time" , " Zero defects" etc.

[ ] Others, please specify _____

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

** THE END **

v

WO KEE SERVICES LTD.

Training Plan for Period (Jul 95 - Dec 95)

Item	Training Course Description	Responsible Section	Target Attendees	Jul	Aug	Sept	Oct	Nov	Dec	Remarks
1	普通話初班	香港普通話研習社	Clerical Staff	x						
2	Reception Skills	Services Administration	Receptionists			x				
3	English Conversation	/	Technician					x		
4	Audio New Model	Technical Service (Audio)	Technician (Audio)						x	
5	"CDR-V500" Training	Technical Service (Video)	Technician (Video)		x					
6	"Autochanger" Training	Technical Service (Video)	Technician (Video)		x					
7	Refresh Training	Technical Service (Video)	Outdoor Technician (Video)		x	x				
8	New Model Training on Video Products	Technical Service (Video)	Technician (Video)					x		
9	Repair Training (Video Tape)	Technical Service (H.A.)	Technician (H.A.)	x	x					
10	Computer Training Course	/	Distribution Co-ordinator			x				
11	Mandarin	/	China Services Coordinator	x						
12	Problem Solving Technique	QA	Supervisor / Manager			x	x			
13	Quality Control Circle Introduction Course	QA	Committee Members / Team Leaders	x						

Wo Kee Services Ltd. (For Internal Audit) CARS NO. :

CORRECTIVE ACTION REQUEST SHEET

TO	DEPT
DEPT AFFECTED	DATE

DESCRIPTION OF NONCONFORMANCE

ORIGINATOR TITLE

CAUSE

CORRECTIVE ACTION

RESPONSIBLE PERSON COMMITMENT DATE

PREVENTIVE ACTION

RESPONSIBLE PERSON COMMITMENT DATE

STATUS OF CAR	F/U DATE	BY
1		
2		
3		

Wo Kee Services Ltd. (For Supplier) REF. NO.:

承包商之改正及預防行動表

公司名稱（承包商）：

負責人：

提供之服務種類：

發表人： 發表日期：

要求改正之內容

* 由和記電器服務有限公司填寫*

原因

* 由承包商填寫*

改正及預防行動

負責人簽署： 日期：

* 由承包商填寫 *

收表及接納日期： 簽署：

完成日期: 簽署：

* 由和記電器服務有限公司填寫*

- - - - - - - - - - - - FACTOR ANALYSIS - - - - - - - - - - -

Analysis number 1 Listwise deletion of cases with missing values

	Mean	Std Dev	Label
V	4.43182	.62497	Market Price
W	4.68182	.63878	Product Quality
X	3.88636	.94539	Delivery
Y	3.06818	.92504	Advertising
Z	4.04545	.93894	Service Before Sale
AA	4.34091	.74532	Service After Sale
AB	3.75000	1.08102	Assortment
AC	4.40909	.65833	Warranty
AD	4.40909	.69276	Handling of Complaints
AE	4.40909	.92304	Product Functions

Number of Cases = 44

Correlation Matrix:

	V	W	X	Y	Z	AA	AB
V	1.00000						
W	.00265	1.00000					
X	.00626	.24681	1.00000				
Y	.10879	.15564	.24840	1.00000			
Z	.04503	.14100	.34654	.39798	1.00000		
AA	-.17361	.33083	.48532	.40400	.54228	1.00000	
AB	.26677	.25259	.35840	.29651	.19475	.10824	1.00000
AC	.06937	.42733	.22589	.06770	.11971	.27791	.37579
AD	-.04151	.40609	.42772	.28207	.39978	.44427	.45028
AE	-.03115	.38367	.26771	.18446	.11221	.33343	.38456

	AC	AD	AE
AC	1.00000		
AD	.44039	1.00000	
AE	.44533	.45957	1.00000

Determinant of Correlation Matrix = .0581335

Kaiser-Meyer-Olkin Measure of Sampling Adequacy = .77221

Bartlett Test of Sphericity = 110.48131, Significance = .00000

1-tailed Significance of Correlation Matrix:

' . ' is printed for diagonal elements.

	V	W	X	Y	Z
V	.				
W	.49320	.			
X	.48391	.05314	.		
Y	.24104	.15653	.05199	.	
Z	.38580	.18064	.01060	.00373	.
AA	.12987	.01414	.00042	.00327	.00007
AB	.04002	.04905	.00845	.02533	.10261
AC	.32728	.00191	.07019	.33119	.21947
AD	.39454	.00312	.00189	.03179	.00359
AE	.42045	.00507	.03947	.11532	.23417

	AA	AB	AC	AD	AE
AA	.				
AB	.24216	.			
AC	.03388	.00597	.		
AD	.00126	.00108	.00139	.	
AE	.01349	.00498	.00123	.00085	.

Extraction 1 for analysis 1, Principal Components Analysis (PC)

Initial Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
V	1.00000	*	1	3.58343	35.8	35.8
W	1.00000	*	2	1.41248	14.1	50.0
X	1.00000	*	3	1.24493	12.4	62.4
Y	1.00000	*	4	.74433	7.4	69.9
Z	1.00000	*	5	.70622	7.1	76.9
AA	1.00000	*	6	.61088	6.1	83.0
AB	1.00000	*	7	.54542	5.5	88.5
AC	1.00000	*	8	.48660	4.9	93.3
AD	1.00000	*	9	.38326	3.8	97.2
AE	1.00000	*	10	.28246	2.8	100.0

Hi-Res Chart # 1:Factor scree plot

PC extracted 3 factors.

Factor Matrix:

	Factor 1	Factor 2	Factor 3
V	.04458	.34044	.80525
W	.58926	.28200	-.27245
X	.64507	-.19718	.04984
Y	.51215	-.37457	.40097
Z	.56742	-.55245	.21863
AA	.69980	-.47792	-.21254
AB	.60155	.38684	.40931
AC	.60111	.48168	-.18787
AD	.78358	.05451	-.09222
AE	.63791	.34590	-.23389

Final Statistics:

Variable	Communality	*	Factor	Eigenvalue	Pct of Var	Cum Pct
		*				
V	.76631	*	1	3.58343	35.8	35.8
W	.50099	*	2	1.41248	14.1	50.0
X	.45749	*	3	1.24493	12.4	62.4
Y	.56338	*				
Z	.67496	*				
AA	.76330	*				
AB	.67905	*				
AC	.62864	*				
AD	.62547	*				
AE	.58128	*				

VARIMAX rotation 1 for extraction 1 in analysis 1 - Kaiser Normalization.

VARIMAX converged in 5 iterations.

Rotated Factor Matrix:

	Factor 1	Factor 2	Factor 3
V	-.06548	-.01406	.87283
W	.69374	.12827	-.05716
X	.34379	.58130	.03717
Y	.01695	.70295	.26258
Z	.02228	.82071	.03009
AA	.31904	.75164	-.31071
AB	.51478	.22851	.60153
AC	.78579	.01615	.10445
AD	.64116	.46192	.03174
AE	.75201	.12511	.01014

Factor Transformation Matrix:

	Factor 1	Factor 2	Factor 3
Factor 1	.73571	.66712	.11701
Factor 2	.57141	-.70411	.42157
Factor 3	-.36362	.24329	.89922

Hi-Res Chart # 2:Factor plot of factors 1, 2, 3

Factor Score Coefficient Matrix:

	Factor 1	Factor 2	Factor 3
V	-.08832	-.00404	.68469
W	.31464	-.08412	-.09339
X	.03811	.22813	-.00179
Y	-.16350	.36042	.19455
Z	-.17085	.42375	.01156
AA	.01241	.32698	-.27331
AB	.16045	-.00086	.43074
AC	.37315	-.16492	.02769
AD	.20986	.10068	-.02476
AE	.33921	-.09938	-.04487

Covariance Matrix for Estimated Regression Factor Scores:

	Factor 1	Factor 2	Factor 3
Factor 1	1.00000		
Factor 2	.00000	1.00000	
Factor 3	.00000	.00000	1.00000

3 PC EXACT factor scores will be saved.

Following factor scores will be added to the working file:

Name	Label
FAC1_1	REGR factor score 1 for analysis 1
FAC2_1	REGR factor score 2 for analysis 1
FAC3_1	REGR factor score 3 for analysis 1

* * * C R O S S T A B U L A T I O N * * *

Q SOURCE OF CAPITAL
by $Q8 (tabulating 1) Use of Quality Document

$Q8

Q	Count	QD used by TOP Mgt AG	QD used by MIDDLE Mg AH	QD NOT comunicated AI	QD CONTINUOUSLY comu AJ	QD is an important I AK	Row Total
CHINA	1	0	1	0	0	1	3 1.6
U.S.A.	2	1	5	0	6	6	31 16.8
BRITAIN	3	0	2	0	2	2	9 4.9
JAPAN	4	2	4	1	2	4	19 10.3
H.K.	5	9	15	5	12	16	84 45.4
Others	6	0	3	0	3	3	14 7.6
Joint Venture	7	2	4	1	4	5	25 13.5
	Column Total	14 7.6	34 18.4	7 3.8	29 15.7	37 20.0	185 100.0

$Q8

Q	Count	QD is an important F AL	QD KNOWN to all BLUE AM	Row Total
CHINA	1	1	0	3 1.6
U.S.A.	2	7	6	31 16.8
BRITAIN	3	2	1	9 4.9
JAPAN	4	4	2	19 10.3
H.K.	5	17	10	84 45.4
Others	6	3	2	14 7.6
Joint Venture	7	5	4	25 13.5
	Column Total	39 21.1	25 13.5	185 100.0

Percents and totals based on responses

41 valid cases; 11 missing cases

* * * C R O S S T A B U L A T I O N * * *

Q SOURCE OF CAPITAL
by $Q22 (tabulating 1) Methods to Communicate Objectives to Employees

Q	Count	$Q22 Through Operational DC	Through Visual Instr DD	Through Verbal Instr DE	Through on the Spot DF	Through a Written Jo DG	Row Total
CHINA	1	1	1	1	1	1	5 3.0
U.S.A.	2	6	5	7	7	6	31 18.7
BRITAIN	3	1	1	2	1	2	7 4.2
JAPAN	4	3	2	4	3	2	14 8.4
H.K.	5	9	7	23	17	14	70 42.2
Others	6	3	4	4	4	4	19 11.4
Joint Venture	7	2	3	6	5	4	20 12.0
	Column Total	25 15.1	23 13.9	47 28.3	38 22.9	33 19.9	166 100.0

Percents and totals based on responses

47 valid cases; 5 missing cases

* * * C R O S S T A B U L A T I O N * * *

Q SOURCE OF CAPITAL
by $Q31 (tabulating 1) Ways to Ensure Employees Suggestions

$Q31

Q	Count	Monetary Rewards DX	Standards / Goals fo DY	Prizes & Awards DZ	Competitions EA	Education / Training EB	Row Total
CHINA	1	0	0	0	0	1	2 1.9
U.S.A.	2	0	4	4	2	6	17 16.2
BRITAIN	3	0	0	0	1	2	4 3.8
JAPAN	4	1	3	1	0	3	11 10.5
H.K.	5	10	9	8	2	11	46 43.8
Others	6	1	1	3	2	3	13 12.4
Joint Venture	7	1	2	2	1	3	12 11.4
	Column Total	13 12.4	19 18.1	18 17.1	8 7.6	29 27.6	105 100.0

$Q31

Q	Count	Bonus Systems EC	Row Total
CHINA	1	1	2 1.9
U.S.A.	2	1	17 16.2
BRITAIN	3	1	4 3.8
JAPAN	4	3	11 10.5
H.K.	5	6	46 43.8
Others	6	3	13 12.4
Joint Venture	7	3	12 11.4
	Column Total	18 17.1	105 100.0

Percents and totals based on responses

43 valid cases; 9 missing cases

* * * C R O S S T A B U L A T I O N * * *

Q SOURCE OF CAPITAL
by $Q33 (tabulating 1) Use of Formal Evaluation

Q	Count	$Q33 Dismiss Unqualified EF	Find Candidates for EG	Decide on Salary & W EH	Start New Education EI	Rotate People EJ	Row Total
CHINA	1	1	1	1	1	1	5 3.3
U.S.A.	2	3	5	5	6	4	23 15.0
BRITAIN	3	1	1	2	2	1	7 4.6
JAPAN	4	1	4	4	2	4	15 9.8
H.K.	5	10	18	18	14	10	70 45.8
Others	6	3	4	3	3	2	15 9.8
Joint Venture	7	4	4	4	3	3	18 11.8
	Column Total	23 15.0	37 24.2	37 24.2	31 20.3	25 16.3	153 100.0

Percents and totals based on responses

42 valid cases; 10 missing cases

* * * C R O S S T A B U L A T I O N * * *

$Q8 (tabulating 1) Use of Quality Document
by $Q10 (tabulating 1) Participation in Defining Quality Goals

$Q8	Count	$Q10 TOP Mgt AO	MIDDLE Mgt AP	MAIN CUSTOMERS AQ	Row Total
QD used by TOP Mgt	AG	14	13	5	32
					6.8
QD used by MIDDLE Mg	AH	36	36	19	91
					19.4
QD NOT comunicated	AI	7	7	3	17
					3.6
QD CONTINUOUSLY comu	AJ	30	29	15	74
					15.8
QD is an important I	AK	39	38	20	97
					20.7
QD is an important F	AL	39	38	19	96
					20.5
QD KNOWN to all BLUE	AM	25	24	13	62
					13.2
	Column Total	190	185	94	469
		40.5	39.4	20.0	100.0

Percents and totals based on responses

42 valid cases; 10 missing cases

* * * C R O S S T A B U L A T I O N * * *

$Q8 (tabulating 1) Use of Quality Document
by $Q15 (tabulating 1) Participation in the Audit

		$Q15					
	Count	TOP Mgt	Mgt of P roductio n De	Middle M gt of Pr oduc	All Empl oyees of Pro	Mgt of Q C Dept	Row Total
$Q8		CN	CO	CP	CQ	CR	
AG		11	9	8	5	10	49
QD used by TOP Mgt							6.4
AH		28	26	22	12	29	141
QD used by MIDDLE Mg							18.4
AI		5	5	4	3	5	26
QD NOT comunicated							3.4
AJ		26	24	19	11	27	131
QD CONTINUOUSLY comu							17.1
AK		31	30	23	13	33	156
QD is an important I							20.4
AL		32	31	24	12	33	159
QD is an important F							20.8
AM		20	19	15	8	22	104
QD KNOWN to all BLUE							13.6
	Column Total	153 20.0	144 18.8	115 15.0	64 8.4	159 20.8	766 100.0

		$Q15	
	Count	Mgt of O ther Dep t	Row Total
$Q8		CS	
AG		6	49
QD used by TOP Mgt			6.4
AH		24	141
QD used by MIDDLE Mg			18.4
AI		4	26
QD NOT comunicated			3.4
AJ		24	131
QD CONTINUOUSLY comu			17.1
AK		26	156
QD is an important I			20.4
AL		27	159
QD is an important F			20.8
AM		20	104
QD KNOWN to all BLUE			13.6
	Column Total	131 17.1	766 100.0

Percents and totals based on respon[illegible]

38 valid cases; 14 missing cases

* * * C R O S S T A B U L A T I O N * * *

$Q8 (tabulating 1) Use of Quality Document
by GV Desire for ISO 9000

$Q8	Count	GV: Yes, Successfully Ob (1)	Yes, In Progress (2)	Yes, Desired (3)	Row Total
AG QD used by TOP Mgt		1	2	4	7 4.8
AH QD used by MIDDLE Mg		11	6	11	28 19.3
AI QD NOT comunicated		0	0	3	3 2.1
AJ QD CONTINUOUSLY comu		15	6	5	26 17.9
AK QD is an important I		14	6	10	30 20.7
AL QD is an important F		14	6	11	31 21.4
AM QD KNOWN to all BLUE		13	6	1	20 13.8
	Column Total	68 46.9	32 22.1	45 31.0	145 100.0

Percents and totals based on responses

33 valid cases; 19 missing cases

* * * C R O S S T A B U L A T I O N * * *

$Q15 (tabulating 1) Participation in the Audit
by $Q10 (tabulating 1) Participation in Defining Quality Goals

$Q15	Count	$Q10 TOP Mgt AO	MIDDLE Mgt AP	MAIN CUSTOMERS AQ	Row Total
CN TOP Mgt		38	36	19	93 20.4
CO Mgt of Production De		36	35	19	90 19.7
CP Middle Mgt of Produc		28	28	15	71 15.5
CQ All Employees of Pro		15	15	7	37 8.1
CR Mgt of Q C Dept		37	36	20	93 20.4
CS Mgt of Other Dept		29	29	15	73 16.0
	Column Total	183 40.0	179 39.2	95 20.8	457 100.0

Percents and totals based on responses

42 valid cases; 10 missing cases