CHAPTER 2

REVIEW OF LITERATURE

The literature review provides valuable background information to understand the total quality management principles and practices. This material has been gathered through published materials covering facts related to the researched area. Review of the existing literature was conducted to analyse the existing literature and identify gaps for the research work. The topics covered in this chapter are: tenets of quality, principles & frameworks of Total quality management. A comparative study of TQM critical success factors identified in different research studies along with the critical success factors considered for this study are dealt with.

2.1 DEFINITIONS OF QUALITY

Understanding the basic tenets of quality is key to interpretation of TQM concepts. In order to clarify and explicate definitions of quality, Reeves and Bednar (1994) concluded that different definitions of quality are appropriate in different settings. Walter Shewhart (1931) first defined quality as the goodness of a product. American Society for Quality (ASQ) in 1978, defined quality as “the totality of features and characteristics of a product or service that bears on its ability to satisfy given needs.” By the end of 1980s, a simpler, yet powerful, customer-driven definition of quality evolved. Quality is meeting or exceeding customer expectations. Juran (1974) proposed a simple definition of quality: “fitness for use.” This definition suggests that quality be viewed from both external and internal perspectives; that is quality
is related to (1) product performance that results in customer satisfaction; (2) freedom from product deficiencies, which avoids customer dissatisfaction. Quality is also defined as conformance to specifications by Philips Crosby (1979). Feigenbaum (1961) gave more thrust to the economics and defined quality as best for actual use and price. Broh (1982) defines quality as the degree of excellence at an acceptable price and the control of variability at an acceptable cost. Johnson (1999) stated that quality is the capability of the products or services to knowingly satisfy those pre-conceived composite wants of the user(s) that are intelligently related to the characteristics of performance and do not cause major overt or covert reactions or actions by other people. Quality thus is defined from both the user and the operations perspective.

2.2 TOTAL QUALITY MANAGEMENT
2.2.1 Definitions of TQM

Total quality management has many definitions based on various tenets and perspectives and sources. One source is American quality consultants, especially Juran (1974), Deming (1986) and Crosby (1979). Second the Japanese have made vital contributions to TQM (Ishikawa 1985, Yong et al 1999). Third, some have attempted to integrate management theory and research and TQM (Dean and Bowen 1994, Sash Kin and Kisher 1993).

TQM means: Total: everyone is involved; Quality: Meeting customers’ (agreed) requirements at lowest cost, first time, every time; Management: it is owned and led by the management team, top down (Keylley 1991). According to Bounds and Dewhrist (1991) and Bounds (1994), TQM is a comprehensive approach to management, involves implementing strategies and organisational systems that continuously improve quality, reduce cost and ensure consistent, on time delivery of products and
service in order to provide superior value to customers. Gurnani (1999) defines TQM as a set of quality principles and values: to build an organisational structure that supports effective quality improvement initiatives, and to develop and implement a comprehensive set of quality concepts, tools and practices. Feigenbaum (1983) defines TQM as an effective system of integrating the quality development, quality maintenance and quality improvement efforts of various groups in an organisation so as to enable production and service at the most economical level which allow for full customer satisfaction.

TQM is a way of managing to improve the effectiveness, flexibility and competitiveness of a business as a whole (Oakland 1993). TQM is a positive attempt by the organisations concerned to improve structural, infrastructure, attitudinal, behavioral and methodological ways of delivering to the end customer, with emphasis on: consistency, improvement in quality, competitive enhancements, all with the aim of satisfying or delighting the end customer (Zairi et al 1994). BS 5750: part 1, 1992 defines TQM as the management philosophy and company practice that aim to harness the human and material resources of an organisation in the most effective way to achieve the objectives of the organisation. Cullen and Hollingum (1987) say that TQM means exactly what it says, zero defects on products leaving the factory and in services offered. Thus a review of the existing literature reveals that there is no standard definition of the term.

Thus, TQM is an integrated management approach focussing on continuous improvement, through top management commitment, customer orientation, employee empowerment and supplier relationship.
2.2.2 Principles of TQM

As the definitions of TQM vary, so do the constituents and principles of TQM. Many researchers and authors have discussed the essential elements advocated in the writings of the quality gurus. (Watson 1994, Logathetis 1992, Seraph, Benson and Schroeder 1989, Dhalguard, Kristensen and Kanji 1994, Anderson, Rungtusanatham and Schroeder 1994, Ghobadian and Speller 1994). Most of the business organisations have been influenced by the writings of Deming (1986), Hodgson (1987), Watson (1994), Juran (1974) and Crosby (1979), in order to comprehend the prerequisites for effective TQM implementation.

- Edward Deming

The Deming philosophy focuses on bringing about improvements in product and service quality by reducing uncertainty and variability in the design and manufacturing process. To accomplish reductions in variation, he advocated a never-ending cycle of product design, manufacture, test, and sales followed by market surveys and then redesign and so forth. He claimed that higher quality leads to higher productivity, which in turn leads to long-term competitive strength. He synthesized the underlying foundations of his earlier stated 14 points in what he called “a system of profound knowledge”, which included four interrelated parts, appreciation for a system, understanding of variation, theory of knowledge and psychology.

- Joseph Juran

Joseph Juran felt that the major crisis in quality was due to huge costs of poor quality. He advocated the use of quality cost accounting and the analysis to focus attention on quality problems. Juran’s prescriptions focus on
three major quality processes called the quality trilogy, that is, quality planning, quality control and quality improvement. He advocated establishing units of measurement to evaluate data objectively, establishing standards of performance, measuring actual performance, interpreting the difference between actual performance and the standard and taking action on the difference.

- **Philip. B Crosby**

  Philip. B Crosby propounded the absolutes of quality management, which included Quality means conformance to requirements, not elegance, doing the job right the first time is always cheaper, performance measurement is the cost of quality, which is the expense of non-conformance and performance standard is “zero defect”. Crosby’s basic elements of improvements include determination, education and implementation.

- **Feigenbaum**

  Feigenbaum is best known for coining the phrase total quality control, which he defined as “….an effective system for integrating the quality development, quality maintenance and quality improvement efforts of the various groups in an organisation so as to enable production and service at the most economical levels which allow full customer satisfaction.” Many of his ideas remain embedded in contemporary thinking, and have become the important elements of the Malcolm Baldrige National quality award criteria. They include the principles that the customer is the judge of quality; quality and innovation are interrelated and mutually beneficial; managing quality is the same as managing business; quality is a continuous process of improvement; and customers and suppliers should be involved in the process.
- **Dr. Ishikawa**

  Dr. Ishikawa influenced the development of participative, bottom–up view of quality, which became the trademark of the Japanese approach to the quality management. He promoted greater involvement by all employees, from the top management to the front staff, and reducing reliance on professional quality departments.

  Although each of the quality gurus on quality management has his own distinctive approach, there are some common points in all teachings. There is a broad agreement that all aspects of activities should be looked at for quality improvement, as all these contribute towards quality. Functional integration is considered to be an important ingredient of TQM and Quality is considered to be a company-wide activity. All the Gurus emphasize role of top management for quality. It is the management’s responsibility to provide commitment, leadership and the appropriate support to technical and human processes. The importance of education and training is emphasized in changing employees’ beliefs, behaviour and attitudes and enhancing their competencies in carrying out their duties. The emphasis is on prevention of product defects, not inspection after the event and on reduction of the costs of quality to improve competitiveness.

  Although these gurus have been clear on broadly what is needed for TQM implementation, little guidance is offered on direct relevance to organisations. It is important that organisations do not rigidly apply the methods proposed by the gurus. Organisations need to examine the suggestions and match them to their specific requirements (Ghobadian and Speller 1994; Garvin 1987).


2.2.3 TQM Awards and Frameworks

Since direct measurement of quality improvement is difficult, quality certification (Corbett et al 2000) and winning awards (Hendricks and Singhal 1997) is a credible proxy for good quality. The award frameworks are seen to be the best-practice models for implementing excellence strategies, performing self-assessments, benchmarking and ultimately delivering improved performance. Among the TQM models Deming Application Prize, the Malcolm Baldrige National Quality Award Criteria (MBNQA), European Foundation for Quality Management (EFQM) and the ISO and the allied quality management standards are used widely. The unique feature of the quality awards is that they are based on multilevel definitions of TQM. It is built upon a set of core values and concepts, which are recognized as the highest level in the model. In order to meet these goals, the criteria have developed into a comprehensive definition of TQM, which is widely accepted for practical use in the organizations and theoretically validated by numerous studies.

The broad aim of the quality awards as described by Ghobadian and Woo (1996) is listed below:

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

2.2.3.1 Deming Application Prize

The Deming Prize judging criteria consists of ten major categories which include policies, organisation and its operations, education and dissemination, Information gathering, communication and utilization, analysis, standardisation, control, quality assurance, effects and future plans.

2.2.3.2 Malcolm Baldrige National Quality Award

Malcolm Baldrige National quality award’s criterion for performance excellence establishes a framework for integrating total quality principles and practices in an organisation (Figure 2.1). It is designed to encourage companies to enhance their competitiveness through an aligned approach to organisational performance management. The purpose of the award is to form a basis for organizational self-assessments and to provide an external assessment process to objectively assess an organization’s quality management practices and to select quality award winners.
Three additional goals have been added to the criteria:

- Assistance in improving performance practices and capabilities
- Facilitation of communication and sharing of best practices and information among organizations of all types
- Provision of a working tool for understanding and managing performance, planning and training

2.2.3.3 The European Quality Award

The European Quality Award (1991) has award process similar to Deming prize and Baldrige Award. The assessment is based on customer satisfaction, business results, processes, leadership, people satisfaction, resources, people management, policy and strategy and impact on society (Figure 2.2). The categories are roughly equivalent to those in Baldrige.
However the criteria for people satisfaction, customer satisfaction, impact on society and business results are somewhat different. The impact on society results category focuses on the perceptions of the company by the community at large and the company’s approach to the quality of life, the environment and the preservation of the global resources.

2.2.3.4 ISO 9000 Quality Management Systems

ISO is a worldwide federation of national standards bodies. The ISO 9000 is a series of internationally accepted guidelines as to how companies should set-up quality assurance systems. Focusing on procedures, controls, and documentation, the standards are designed to help a company identify mistakes, streamline its operations, and be able to guarantee a consistent level of quality. ISO 9000 defines standards as documented agreements containing precise criteria to be used consistently as rules,
guidelines, definitions or characteristics, to ensure that materials, products, processes and services fit their purpose. The standards were created to meet five objectives:

(i) Achieve, maintain and seek to continuously improve product quality (including services) in relationship to requirements.
(ii) Improve the quality of operations to continually meet customers’ and stakeholders’ stated and implied needs.
(iii) Provide confidence to internal management and other employees that quality requirements are being fulfilled and that improvement is taking place.
(iv) Provide confidence to customers and other stakeholders that quality requirements are being achieved in the delivered market.
(v) Provide confidence that quality system requirements are fulfilled.

Most of the basic principles of ISO 9000 and TQM are common. There are only two areas in ISO 9000 not explicit in TQM, customer supplied product control and quality records.

2.2.3.5 QS 9000 Quality Management System

QS 9000, an extended version of ISO 9000 standards, is a quality system developed by the big three automobile manufacturers (Ford, Chrysler and General Motors) in the US in 1994. Until the introduction of QS9000 these individual manufacturers has imposed separate quality requirements on their suppliers, each with its own set of demands. By streamlining these three separate requirements into one commonly used set of standards QS9000 virtually eliminated the varying demands and the wastefulness that
accompanied them thereby making it easier for the suppliers to do business with the automakers.

QS9000 is based on ISO 9000 and includes all ISO requirements. However it goes well beyond ISO by including additional requirements such as continuous improvement, manufacturing capability and production part approval processes. QS9000 includes requirements that suppliers have a formal, documented, comprehensive business plan and to develop both short and long term goals and plans based on the analysis of competitive products and benchmarking information, and to revise and review the plan appropriately. It also prescribes methods to determine current and future customer expectations along with an objective and valid process to collect the information. It defines a process for determining customer satisfaction, operational performance (productivity, efficiency, effectiveness and current quality levels for key product and service features), and enables comparison with those of competitors and / or appropriate benchmark.

QS9000 advocates extensive requirements for documenting process monitoring, operator instructions, and process capability and performance requirements to be built into the standard. It emphasizes defect prevention as well as reduction of variation and waste. QS9000 eliminates redundant requirements while maintaining customer specific, division-specific and commodity-specific requirements. Internal and external suppliers of production and service parts, sub-assemblies, materials components, or other items to the major automakers must conform to the requirements set forth by QS9000.
2.2.3.6 ISO / TS 16949

ISO/TS 16949:2002 is an ISO technical specification that represents a comprehensive quality management system for the global automotive industry to achieve world-class levels of product quality, productivity, competitiveness and continual improvement. It is an ISO technical specification jointly developed by the International Automotive Task Force (IATF) and serves as a common automotive quality system requirements catalogue. It specifies the quality system requirements for the design, development, production, installation and servicing of automotive-related products. The IATF, which consists of an international group of vehicle manufacturers and national trade associations, developed these standards in conjunction with the ISO. This specification aligns existing American German, French and Italian automotive quality systems standards within the global automotive industry. IATF first developed ISO/TS 16949:1999. This first edition was extensively revised in line with ISO 9001:2000 and published in March 2002 as ISO/TS 16949:2002.

The goal of ISO/TS 16949:2002 was the development of a global management system that provides for continual improvement, emphasizing defect prevention and the reduction of variation and waste in the supply chain. It emphasizes a process approach, commitment to quality by the top management, increased emphasis on customer focus and continual improvement. Along with customer specific requirements, ISO/TS 16949:2002 standard will eliminate the need for multiple certifications to and will be recognized globally.
2.3 CRITICAL SUCCESS FACTORS FOR TQM IMPLEMENTATION

The critical success factors of TQM can be described as best practices or ways in which firms and their employees undertake business activities in all key processes: leadership, planning, customers, suppliers, community relations, production and supply of products and services.

Identifying critical success factors is the key for structuring environmental analysis and organisational strategies for successful implementation of TQM. There is an important link between environmental analysis and critical success factors leading to organisational success (Digman 1990). The critical success factor analysis method has an important meaning to TQM through identification of core processes that are critical in Total quality management implementation. Also a quality management program needs to identify critical performance indicators or success factors to gauge its success.

The findings of key quality Gurus, recent empirical evidence, criteria of the quality awards and models are the major sources that have been used in this study to identify the critical success factors for TQM.

2.3.1 Empirical Research on Critical Success Factors

The literature review provides a road map to identify the fundamental ingredients for implementation of TQM. Based on the review of literature, ten CSFs and four outcomes were identified. The identified variables were reviewed with quality experts and modifications were made based on their feedback.
Many of the studies (Table 2.1) have proposed key variables for successful implementation and measurement of TQM success. One of the first studies to operationalise the CSFs of TQM using a survey-based approach was that of Saraph, Benson and Schroeder published in 1989. Later several empirical studies, including Anderson, Rungtusanatham, Schroeder and Devaraj (1995), Ebrahimpur et al (1992) and Flynn, Schroeder and Sakakibara (1995) Joseph et al (1999) examined the various aspects of quality management implementation. Anderson, Rungtusanathanam and Schroeder’s (1994) work identified seven concepts underlying the Deming management method moving toward an articulated theory of management.

Saraph, Benson and Schroeder (1989) provide an empirical framework based on eight critical factors of quality management, namely, top management leadership, quality data and reporting, process management, product/service design, training, Supplier quality management, role of the quality department and employee relations. The domain of their study was limited in that it did not include items relating to customer satisfaction and customer relationship management. The only customer-focused variables were included in the product/service design factor.

A study on the critical success factors by Black et al (1996) covered areas not included by Saraph et al (1989). His study used a ratio – scaling questionnaire through which he identified 10 critical factors of TQM. Customer Satisfaction orientation, teamwork structures, and communication of improvement information factors were the new factors which emerged from the study.
Table 2.1 Comparative List of TQM CSFs in empirical studies

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Some studies have empirically investigated how the factors associated with TQM predict customer perception of quality (Waldman and Gopalakrishnan 1996). Flynn, Schroeder and Sakakibara (1995) studied quality management and performance relationship at the plant level. They proposed and tested among other things, the linkage between core quality management practices (e.g. statistical control) and quality management infrastructure practices such as employee empowerment, teamwork, etc.

2.3.2 Parameters of Critical Success Factors

The critical factors of TQM can be ascertained by parameters. The performance measures of the various critical factors of TQM are as shown in Table 2.2.

2.3.3 TQM CSFs of auto component industry

For this study, Critical Success factors for TQM implementation were considered after review of literature. Also the fact that the focus of ISO 9000:2000, QS9000 and ISO/TS 16949:2002 registrations is in compliance with specified practices so as to guarantee a consistent level of product quality. Hence the factor of product quality was also included in this study. The Critical Success factors of TQM identified for this study are:

1) Top Management Leadership and Commitment
2) Strategic planning
3) Quality Measurement
4) Benchmarking
5) Training
6) Human resource focus
7) Process Management
8) Supplier Quality Management
9) Customer Focus
10) Product Quality

Table 2.2 Performance measures of CSFs

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<thead>
<tr>
<th>Critical Success Factor</th>
<th>Measures of Performance</th>
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<tr>
<td>Top Management Leadership and commitment</td>
<td>Allocate budget and resources, Control through visibility, Monitor Progress, Planning for Change</td>
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<td>Strategic Planning</td>
<td>Quality as part of long plan, Clearly defined mission &amp; vision, Review of goals at defined intervals</td>
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<td>Quality Measurement</td>
<td>Zero – Defect Conformance, Use SPC for Process Control, Cost of Quality, Proportion of defects</td>
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<td>Benchmarking</td>
<td>Percentage of products needing rework, Defective rate relative to competitors</td>
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<td>HR Focus</td>
<td>Employees suggestion schemes, Guidelines for decision making for operators, appreciation &amp; rewards</td>
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<td>Training</td>
<td>Training hours, Cross – training employees, Training / retraining budget</td>
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<tr>
<td>Process Management</td>
<td>Design for manufacturability, Reduce Cycle time, Reduce Setup time, Productivity, Production goals</td>
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<tr>
<td>Supplier Quality Management</td>
<td>Reduce inventory, Supplier relations, Number of suppliers, Inventory turnover, Material cost, Implement kanban,</td>
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<tr>
<td>Customer Focus</td>
<td>Delivery Dependability, prompt handling of complaints, Percentage of complaints, percentage of late deliveries Time to respond to customer queries</td>
</tr>
<tr>
<td>Product Design</td>
<td>Number of new products introduced, time taken from design to first sale, fitness for use, design quality</td>
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2.3.3.1 Top management leadership and Commitment

The European Quality Award and the Malcolm Baldrige Quality Award recognizes the crucial role of top management leadership in creating the goals, values and systems that guide the pursuit of continuous performance improvement. Recognition of the critical role of top management and its responsibility in pursuit of quality improvement echoes the arguments put forward by gurus of quality such as Deming, Juran, and Crosby. A predominant theme in TQM literature is that strong commitment from top management is vital. The foundation of an effective TQM effort is commitment. Lack of top management commitment is one of the reasons for the failure of TQM efforts (Brown et al 1994). Garvin (1988) reports that high levels of quality performance have always been accompanied by an organisational commitment to that goal; high product quality does not exist without strong top management commitment. Many such empirical studies have also found that top management support for quality is a key factor in quality improvement. If top managers are committed to quality, they should not only actively be involved in quality management and improvement process, but also strongly encourage employee involvement in quality management and improvement process. In addition, they should learn quality-related concepts and skills, and arrange adequate resources for employee education and training. Various quality-related issues should also be often discussed in top management meetings. Top management should pursue long-term business success and focus on product quality rather than yields. This variable is mentioned as a critical success factor of TQM by many previous researchers such as Saraph et al (1989), Black and Porter (1996), Ahire et al (1996), Anderson et al (1994), Powell (1995), Thiagarajan and Zairi (1998) and Sureschander et al (2001). Flynn, Sakakibara and Schroeder (1994) use top management support as leadership in their model.
2.3.3.2 Strategic planning

Quality enforcement procedures, such as the quality control charts that ensure conformance to specifications and help identify potential problems are likely to be used when a company places a high emphasis on quality (Juran 1988, Feigenbaum 1983). Action planning makes it easier to detect delays and problems before they occur (Yukl 1990). Effective managers plan well and communicate task-relevant information such as product specifications to employees when the emphasis on quality is high. (Kathuria et al 2003). Malcolm Baldrige Quality Award includes this variable as strategic quality planning, whereas Flynn, Sakakibara and Schroeder (1994) use the term strategic management.

2.3.3.3 Quality Measurement

Measurement is the key to success (Oakland 1993). A well-defined process management approach should include a documented methodology of change, use objective and quantified metrics showing the value of change, continuously communicate process metrics to senior management, and possess a well-documented rollout of the new process design.

2.3.3.4 Benchmarking

Benchmarking is a driving force in intense competition which leads to a search for excellence, in order to become or stay competitive in the market place (Bagchi 1996). Voss et al (1997) shows a link between the use of benchmarking and improved operational and business performance. Benchmarking can lead to broad improvements in strategic thinking and the capacity for change (Drew 1997). Benchmarks serve to convert strategies into tactics and through alignment and linkage, into action.
2.3.3.5 Training

Deming (1986) stresses the importance of education and training for continual updating and improvement. As Collard (1989) states, ‘investment in training is a critical factor in the success of a total quality programme’. Ferketish and Hayden (1992) suggest that human resource development plays a significant role in supporting and driving a continuous improvement culture. They argue that training can be a powerful building block in allowing a business to achieve its goals.

2.3.3.6 Human resource focus

Kofman and Senge (1993) and Sashkin and Kiser (1993) make it clear that successful TQM and learning organisations initiatives must transform the organisational culture. Caudron (1994) and Watkins K. Marsick (1996) illustrate the role that Human Resource Development (HRD) plays in affecting the key elements of TQM and learning organisations. Shetty (1992) and Lawler (1992) both identified that human resources management and employee involvement are critical to adoption of TQM. Thus an important feature of any quality improvement program is showing due recognition for improved performance by any individual, section, and department or division within the company. To effectively support their quality efforts, organisations need to implement an employee compensation system that strongly links quality and customer satisfaction with pays (Brown et al 1994).

Dean and Bowen (1994) confirmed the importance of teamwork in implementing total quality, while Eishenn et al (1992) argued that the executives committed to quality must give employees the authority to make certain decisions on their own. Managers implementing quality initiatives would empower employees rather than be behaviourally directive. Anderson,
Rungtusanathan and Schroeder (1994) validated and identified employee empowerment (delegating) as an important concept underlying the Deming quality management method. Flynn, Schroeder and Sakakibara (1995) established the direct effect of some work force management practices, such as employee empowerment and team problem-solving approaches, on work attitudes. Due to increased awareness of responsibility and equity among subordinates, empowerment also leads to increased employee participation (Everett and Sohal 1991).

A key principle underlying quality management is the notion of inter-departmental communication (Deming 1982). Flynn, Schroeder and Sakakibara (1995) also argued that communication is considered critical for quality management. Also Anderson, Rungtusanathanam and Schroeder (1994) evidenced that opening the feedback channels was important for quality management.

### 2.3.3.7 Process Management

A key part of any total quality strategy is the management of processes (Porter and Parker 1993). Process refers to some unique combinations of machines, tools, methods, materials, and people engaged in production (Juran and Gryna 1988).

Process management focuses on managing the manufacturing process so that it operates as expected, without breakdowns, missing materials, fixtures, tools, etc., and despite work-force variability. One important matter in process management is the maintenance of process capability to meet production requirements. One aspect of process management is equipment maintenance, which ensures that variation is kept within acceptable bounds, keeping the manufacturing process running.
smoothly. Good process management should precisely involve documenting various process procedures, including giving instructions for equipment operation in order to minimise the likelihood of operator errors. Some methods, such as Plan-Do-Check-Act (PDCA) cycle, seven Quality Control (QC) tools, statistical process control (SPC), sampling and inspection are effective for process control and process improvement.

2.3.3.8 Supplier Quality Management

Supplier quality management is an important aspect of TQM since materials and purchased parts are often a major source of quality problems. The Malcolm Baldrige Quality Award also recognises the importance of supplier quality. Garvin (1987) finds that organisations that manufacture the highest quality products have purchasing departments that rank quality rather than cost minimisation as their major objective. Conversely, in organisations with the lowest quality performance, he finds that the primary objective of the purchasing department is to obtain the lowest price for technically acceptable components. Poor quality of supplier products results in extra costs for the purchaser; example, for one appliance manufacturer, 75 percent of all warranty claims were traced to purchased components for the appliances (Juran and Gryna 1993). If organisations pursue good supplier quality management, they should establish long-term co-operative relations with their suppliers, often participate in supplier quality activities, have detailed information concerning supplier performance, give feedback on the performance of suppliers’ products, regularly conduct supplier quality audits, and regard product quality as the most important factor for selecting suppliers.
2.3.3.9 Customer focus

To achieve quality, it is essential to know what customers want and to provide products or services that meet their requirements (Ishikawa, 1985). The customer should be closely involved in the product design and development process, with inputs at every stage of the process so that there is less likelihood of quality problems once full production begins (Flynn et al 1994). One of Ishikawa’s five strategic actions is to build a long-term consumer orientation, both outside and inside the company. Woodruff emphasizes that more outward orientation towards customers will be the new major source of competitive advantages.

2.3.3.10 Product design

Enabling employees to conform to product specifications is a key manufacturing task associated with quality Juran (1974), Feigenbaum (1983) and Ishikawa (1985). Product design is an important dimension of quality management. For complex products, errors during product development cause about 50 percent of fitness-for-use problems (Juran and Gryna 1993). Sound product design meets or exceeds the requirements and expectations of customers better than the competitors, leading to an increased market share. For improving product design, design engineers are required to have some shop floor and marketing experiences. Customer requirements and production cost should be thoroughly considered during the process of product design. Different departments in an organisation should participate in new product development. Before production, new product design should be thoroughly reviewed in order to avoid problems happening during production. Experimental design and quality function deployment are two important and effective methods in product design (Zhang 1998b).