

## Gurus of quality: a framework for comparison

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**Abstract** 'Quality' is an important competitive factor and in some markets a prerequisite of survival. This is why more and more organizations are implementing BS 5750 and total quality management (TQM). The 'quality' field is dominated by a number of scholars, the so-called gurus of 'quality'. Many organizations in their haste to introduce TQM turn to the gurus. Their methods are implemented in a formulaic manner. Management often fails to consider the relevance of the approach to the organization's needs and values. In this paper, we briefly describe the key features of the methods of Deming, Juran, Crosby, Feigenbaum, Taguchi, Ishikawa and Grocock. These seven are considered by many to be the main gurus of quality. In addition, we develop a matrix of key factors for each guru. This will enable the managers and researchers to compare the various methods in a systematic fashion, thus assisting the management to choose a particular method rationally. Alternatively, this paper will assist them in developing a hybrid method suited to their organization's needs. The paper also considers the similarities and differences between the methods.

### Introduction

The 1990s look set to see the 'quality' revolution of the 1980s spreading to more and more organizations. Moreover, in this decade the 'quality' revolution will spread beyond manufacturing organizations to both private and public services. This is because quality is considered to be an important competitive weapon (Shetty, 1987).

Many organizations base their quality approach on the work of one of the so-called 'quality gurus'. This is a term coined to reflect their influence on: (a) the organization and practice of quality management; and (b) modern management thinking. The list of gurus generally includes Deming, Juran, Crosby, Feigenbaum, Taguchi, Ishikawa and Grocock. Arguably, this list is not exhaustive and there are others who have influenced the development of quality issues.

The purpose of this paper is: (a) to examine the salient features of each guru's method; (b) to compare their approach using a comparison framework; and (c) to assess their applicability to different business circumstances. The paper will enable managers and researchers to appreciate the common ground and differences between each guru's thinking and approach. In addition, this paper may provide useful guidance on matching the quality approach to particular organizational situations and needs.

The approach of each guru is outlined in turn. A full matrix for comparison is developed. The 'common ground' and 'key differences' for the gurus are discussed. The applicability of

the various approaches for different organizations is considered, and some shortcomings and limitations identified.

### Framework of comparison

To compare the approaches of the various gurus systematically, a matrix of key features was developed. Initially, six key factors were selected. These were: (a) general approach; (b) external interface; (c) organizational context; (d) organizational requirements; (e) means and techniques; and (f) pace and nature of change. Each key factor was then divided into a number of important determinants. These were as follows:

- *General*: (a) definition; (b) main emphasis; (c) dominant factor; (d) scope of application; and (e) sector applicability.
- *External interface*: (a) customer focus; (b) market focus; and (c) vendor/buyer relationship.
- *Organizational context*: (a) primary change agent; (b) top management role; (c) management style; and (d) organization culture.
- *Organizational requirements*: (a) top management commitment; (b) employee involvement; (c) education and training; and (d) investment in non-human resources.
- *Means and techniques*: (a) costs of quality; (b) training programmes; (c) means of participation and feedback; (d) statistical methods; (e) recognition and reward system; and (f) inspection procedures.
- *Change*: (a) pace; and (b) nature.

The proposed framework has two major advantages. First, it facilitates a systematic comparison between various approaches. Second, it provides a means for identifying the key attributes of each approach.

### Classical approaches to quality: the gurus

The 'discovery' of quality and its application to management thinking and practices, particularly in manufacturing operations, is usually traced back to the visits of Deming and Juran to Japan in 1950 to assist in the process of industrial reconstruction after World War II. The ready response to the messages of Deming and Juran from Japanese industry, in marked contrast to the lack of attention at that time in the US, has passed into business management folklore. Garvin (1984) has described how the discovery of total quality since 1950 has spread from Japan to the US, then to the Pacific basin and Europe, followed closely by developing countries in the 1980s.

This process of diffusion of quality concepts and ideas is significant in illustrating how and why management adopts a quality approach to its organization, and thus the reasons why it may succeed or fail in doing so. It has been suggested that quality is being overemphasized now, and that quality concepts and the practices associated with them are being adopted as panaceas and recipes for success, without regard to the context and circumstances involved in developing and implementing them. Thus, Christopher Lorenz (1993) incorporates excellence and quality circles in his lists of business fads and fashions adopted wholesale by organizations as a short-cut to increased competitiveness and success.

These dangers were readily recognized by Deming and the other gurus. Recently, Crosby and others identified this danger in deploring the adopting of quality systems as a fad during the 1980s, the over-simplified approach, looking for 'instant pudding'. The other

negative aspect identified is that commitment by management is sometimes superficial 'cheerleading' rather than implementation (Karabatsos, 1989).

### *Deming's approach to quality*

Deming is widely regarded as the person who helped to bring about the Japanese quality revolution. He is associated with statistical process control (SPC) and other problem-solving techniques which measure performance in all processes. His definition of quality is that of "satisfying the customer, not merely to meet his expectations, but to exceed them". This means focusing on the customer's needs, not just demands (as expressed by effective demand in the market-place). Deming has stressed the need to stay ahead of the customer, to anticipate needs and demands. Deming's philosophy thus starts and finishes with the customer. The aim is to add value which the customer wants. Anything which does not do this is not a quality feature.

The means to improve quality are in the ability to control and manage systems and processes properly, and the nature of management responsibilities in achieving this. Deming is associated with SPC and other problem-solving techniques which aim to improve processes and reduce the inevitable variation which occurs in production from 'common causes' and 'special causes'. 'Common causes' of variations are systemic and are shared by many operators, machines or products. They include poor product design, incoming materials not suited to their purpose, and poor working conditions. These are the responsibilities of management. 'Special causes' relate to the lack of knowledge or skill or poor performance. These are the responsibility of operators and workers.

Deming stressed the responsibility of top management to take the lead in changing processes and systems. Management is responsible for most quality problems (85 or 94% have been quoted). Management should give workers clear standards for what is considered acceptable work, and provide the tools to achieve it. These tools include the appropriate working environment and climate for work—free of fault finding, blame or fear. Deming also strongly promoted employee participation. These are set out in his 14 points or guidelines for Managers (Deming, 1986). These were not intended as 'tablets of stone'.

The 14 points put forward by Deming are summarized below.

- (1) Create consistency of purpose to improve products and services—take a longer term view, and innovate.
- (2) Adopt the new philosophy—accept the management style which promotes constant improvement.
- (3) Cease dependence on mass inspection—concentrate on improving processes.
- (4) End the practice of awarding business on price tag alone, build up relationships with fewer suppliers to understand jointly specifications of and uses for materials and other inputs.
- (5) Constantly and forever improve the system—search continually for problems in all processes. It is management's job to work on the system.
- (6) Institute modern methods of training on the job—for all, to make the best use of every employee.
- (7) Institute modern methods of supervision—managers to focus on quality not numbers.
- (8) Drive out fear—so that people work more effectively.
- (9) Break down barriers between departments—teamworking to tackle problems.

Table 1. *Salient characteristics of Deming's approach*

|                                |                                                              |                                                                                                             |
|--------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Customer-led                                                                                                |
|                                | Main emphasis                                                | Process                                                                                                     |
|                                | Dominant factor                                              | Control of variation                                                                                        |
|                                | Scope of application                                         | Holistic                                                                                                    |
|                                | Applicability—sector                                         | Manufacturing emphasis                                                                                      |
| B. External                    | Customer focus                                               | Surprise, delight customers; anticipate customer needs                                                      |
|                                | Market focus (environment)                                   | Quality needed to stay in business                                                                          |
|                                | Vendor/buyer relationship                                    | Considered integral; quality requirement of vendors                                                         |
| C. Organizational context      | Primary change agent                                         | Top management                                                                                              |
|                                | Top management role                                          | To promote quality; to work on the system                                                                   |
|                                | Management style                                             | Participative                                                                                               |
|                                | Organization culture                                         | Quality as an organizational culture.<br>Integrated—need to break down 'barriers'                           |
| D. Organizational requirements | Top management commitment                                    | Essential starting point                                                                                    |
|                                | Employee involvement/participation                           | Essential                                                                                                   |
|                                | Education and training                                       | Essential—a vigorous programme                                                                              |
|                                | Investment in non-human resources                            | Essential—to reduce total costs                                                                             |
| E. Means/ techniques, etc.     | Costs of quality (appreciated)                               | Reduce total costs                                                                                          |
|                                | Training programmes                                          | Essential—especially training on the job for all to reskill                                                 |
|                                | Participation/feedback (e.g. communication, quality circles) | Achieve in both positive way (e.g. teamwork) and negative way (e.g. drive out fear, eliminate exhortations) |
|                                | Statistical methods                                          | Statistical process control                                                                                 |
|                                | Recognition/rewards systems                                  | Increased job satisfaction through quality and pride in workmanship. Performance appraisal irrelevant       |
|                                | Inspection procedures                                        | End mass inspection, which accepts errors/defects. Obtain statistical evidence of built-in quality          |
|                                |                                                              |                                                                                                             |
| F. Change                      | Pace of change                                               | Implicitly gradual—in implementing the 14 points                                                            |
|                                | Nature of change                                             | Continuous improvement philosophy                                                                           |

- (10) Eliminate numerical goals for the workforce—eliminate slogans and exhortation, make reasonable requests of the workforce.
- (11) Eliminate work standards and numerical quotas—focus on quality and provide support.
- (12) Remove barriers that rob workers of pride in their work—for example, defective materials, poor tools, lack of management support.
- (13) Institute a vigorous programme of education and training—for continual updating and improvement.
- (14) Create a top management structure to push every day on the above 13 points. Top management commitment is where it begins and ends.

Table 1 depicts the salient characteristics of Deming's approach.

*Juran's approach to quality*

Juran defines quality as "fitness for purpose or use". This definition is applicable to all organizations, that is manufacturing, service, profit-making; or non profit-makers (Juran *et al.*, 1974). Quality is judged by the user or customer. The aim is to satisfy the customer with the right amount; any more or less costs money. This is thus an external, customer-led approach. It is quite different from a "conformance to requirements or specification" approach. A product or service could conform to its specification, yet fail to be fit for its purpose.

Fitness for purpose or use has five major dimensions or quality characteristics. These are listed as follows.

- (1) Quality of design—the design concept and its specification.
- (2) Quality of conformance—the match between actual product and design intent.
- (3) Availability—including reliability and maintainability. These are all time-oriented.
- (4) Safety—risk of injury due to product hazards.
- (5) Field use—product conformance and condition after it reaches the customer.

These dimensions and characteristics are further subdivided into a 'tree of quality'. This illustrates Jurán's comprehensive approach to quality—to span a product's entire life—including design, vendor relations, process development, manufacturing control, inspection, test, distribution, customer relations and field service. Each area needs to be examined carefully. It also illustrates Jurán's emphasis on the importance of non-technical aspects of quality control as well as traditional technical aspects. He identified problems with organization, communication and coordination of functions—the human element. Understanding this is a prerequisite for solving technical problems.

Like Deming, Jurán believes most quality problems are due to management, not workers. Top management need training in quality as much as they usually get it in finance. The approach to quality needs to be inter-departmental, which top management can ensure. Jurán also shares with Deming a dislike of 'campaigns' of exhortation and motivation to do 'perfect work' or achieve 'zero defects', because such an approach is not reasonable or achievable and fails to set specific goals. A distinctive feature of the Jurán approach is the emphasis on team and project work. He proposes quality circles as a way of: (a) promoting quality improvement and (b) improving communications between management and employees. He recommends SPC but warns against this leading to a tool-oriented approach.

Juran advocates ten steps to quality improvement. These are as follows.

- (1) Build awareness of the need and opportunity for improvement.
- (2) Set goals for improvement.
- (3) Organize to reach the goals (establish a quality council, identify problems, select projects, appoint teams, designate facilitators).
- (4) Provide training.
- (5) Carry out projects to solve problems.
- (6) Report progress.
- (7) Give recognition.
- (8) Communication results.
- (9) Keep score.
- (10) Maintain a momentum by making annual improvement part of the regular systems and processes of the company.

Juran's approach is essentially a practical one, not a perfectionist 'zero-defects' one. The

attraction of a quality approach to top management is to reduce the costs of quality. Juran identified four types of cost associated with quality:

- (1) internal failure costs (defects discovered before shipment);
- (2) external failure costs (defects discovered after shipment);
- (3) appraisal costs (for assessing the condition of materials and product);
- (4) prevention costs (for keeping defects from occurring in the first place).

It is stated that internal and external failure costs account for between 50 and 80% of the costs of quality. Management should aim to reduce these failure costs to the point where any additional spending on appraisal and prevention would not exceed the savings from decreased failure or defect costs. This suggests that 'zero defects' is not a practical goal.

To achieve the minimum cost of quality, Juran proposes a three-pronged approach:

- (1) breakthrough projects;
- (2) the control sequence;
- (3) annual quality programmes.

At the early stages, when failure costs are high in relation to prevention and appraisal costs, there are significant gains to be made from breakthrough projects on chronic problems. A 'breakthrough sequence' would identify the vital few projects, selling these to management, analyzing the problems, and involving the key people required for the implementation.

The breakthrough sequence involves the following steps.

- (1) Breakthrough in attitudes—convince top management of the need for change and of the benefits (probably in terms of the costs of quality).
- (2) Identify the 'vital few projects'.
- (3) Organize for breakthrough in knowledge, by establishing an inter-departmental steering group which defines the programme and gives the authority for examination of problems, experiments and implementation, serviced by a diagnostic group to analyze the problem, consisting of quality professionals and, sometimes, line managers.
- (4) Conduct the analysis—the diagnostic group study symptoms, develop hypotheses and experiments to find the true causes of the problems. The group determines whether defects are operator or management-controllable. The group uses a wide range of data and techniques for this stage. The group then proposes solutions to the problem.
- (5) Determine how to overcome resistance to change—key people need to be convinced that change is necessary. This is achieved through involving the key people in both technical and social aspects of change.
- (6) Institute the change—departments which are required to take corrective action, need to be convinced in order to cooperate. Effective presentations, adequate time for consideration and training are key elements.
- (7) Institute controls—these need to be established to monitor the solution, to examine that it works and to check on unforeseen developments.

Juran's distinctive contribution to thinking on quality has been to emphasize the primary importance of understanding customer needs, as opposed to demand/wants. This requirement applies to all involved in marketing, design, manufacture and services. Wants only reflect surface features, whereas identifying customer needs requires more vigorous analysis and understanding to ensure the product meets the needs and is fit for the use intended.

The salient features of Juran's approach are shown in Table 2.

Table 2. *Salient characteristics of Joseph Juran's approach*

|                                |                                                              |                                                               |
|--------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Customer-led                                                  |
|                                | Main emphasis                                                | People                                                        |
|                                | Dominant factor                                              | Fitness for purpose                                           |
|                                | Scope of application                                         | Comprehensive programme for product life span                 |
|                                | Applicability—sector                                         | Manufacturing and services                                    |
| B. External interface          | Customer focus                                               | Integral to quality definition                                |
|                                | Market focus (environment)                                   | Not specific                                                  |
|                                | Vendor/buyer relationship                                    | Multiple suppliers—not stressed                               |
| C. Organizational context      | Primary change agent                                         | Management                                                    |
|                                | Top management role                                          | Educative, supportive, avoiding exhortation                   |
|                                | Management style                                             | Participative, enabling                                       |
|                                | Organization culture                                         | Integrated                                                    |
| D. Organizational requirements | Top management commitment                                    | Essential                                                     |
|                                | Employee involvement/participation                           | Essential                                                     |
|                                | Education and training                                       | Essential                                                     |
|                                | Investment in non-human resources                            | As part of improvement programmes                             |
| E. Means/techniques, etc.      | Costs of quality (appreciated)                               | Objective is to obtain optimal quality                        |
|                                | Training programmes                                          | Teamwork approach on breakthrough projects; annual programmes |
|                                | Participation/feedback (e.g. communication, quality circles) | Emphasis on participation and teamwork                        |
|                                | Statistical methods                                          | Some reference to; not integral to approach                   |
|                                | Recognition/rewards systems                                  | Emphasis on recognition                                       |
|                                | Inspection procedures                                        | Eliminate inspection departments                              |
|                                |                                                              |                                                               |
| F. Change                      | Pace of change                                               | Gradual                                                       |
|                                | Nature of change                                             | Step by step, e.g. 'breakthrough' projects                    |

### *Crosby's approach to quality*

If Deming's presentation is sometimes considered a bit theoretical and academic for his intended audience, and if Juran speaks the language of the shopfloor in terms of 'defect rates', etc., Crosby's approach directly addresses its intended market of top executives. He presents a message to executives with a mixture of narrative, anecdotes and case studies.

Crosby's aim has been to change the perceptions and attitudes of top management about quality. He defines quality as 'conformance to requirements', a supply-led definition, thus making quality tangible, manageable and measurable. The requirements of a product need to be defined and specified clearly so that they are properly understood. Quality is measured by the cost of quality. This he defines as the 'expense of non-conformance—the cost of doing things wrong'. His categories of quality costs are similar to those of Juran—prevention, appraisal and failure. The aim is zero defects, of getting it right the first time. This requires an emphasis on prevention rather than after-the-event inspection—the difference between quality assurance and quality control. Crosby's maxim that 'quality is free' is based on the reasoning that quality improvements will reduce total costs, thus increasing profitability (Crosby, 1980).

The key to quality improvement is to change the thinking of top managers—to get them not to accept mistakes and defects as this would in turn reduce work expectations and standards in their jobs. Understanding, commitment and communication are all essential.

Like Deming and Juran, Crosby promotes a participative management approach and culture in an organization. Also, like Deming and Juran, Crosby stresses that managers are responsible for quality. They must lead the process, but participation via teamwork in quality improvement teams and quality councils is essential. Unlike Juran, improvement is brought about on a continuous basis towards important goals, not project by project.

Overall progress in the organization can be assessed by using a quality management maturity grid. This sets out five stages of development to a fully mature quality management approach, starting with uncertainty, then awakening, enlightenment, wisdom and, finally, certainty. These can be used to assess progress on a number of 'measurement categories', such as management understanding and attitude, the status of quality in the organization, problem handling, cost of quality as a percentage of sales, quality improvement actions and a summation of the company's quality posture. The quality management maturity grid and cost of quality measures are the two main tools for managers to assess the seriousness of their quality problems. Once companies position themselves on the grid, Crosby offers a 14-step programme for quality improvement. The 14 steps emphasize in particular management commitment, a participative organizational culture for developing quality awareness and action throughout the organization, an emphasis on prevention of defects over inspection and the continuous nature of the quality improvement process. Crosby's proposed 14 steps are summarized below.

- (1) Management commitment—make clear where management stands as regards quality.
- (2) Quality improvement team—set up a team to run the quality improvement programme.
- (3) Quality measurement—provide a display of current and potential non-conformance problems in a manner that permits objective evaluation and corrective action.
- (4) Cost of quality evaluation—define the ingredients of the cost of quality and explain its use as a management tool.
- (5) Quality awareness—provide a method of raising the personal concern felt by all personnel towards product/service conformance and the reputation of the company.
- (6) Corrective action—provide a systematic method of resolving quality problems that have been identified through the previous steps.
- (7) Zero-defects planning—examine, identify and implement the actions necessary prior to the launch of 'zero-defect' programme.
- (8) Employee education—identify and introduce the training that employees need in order to carry out their part in the quality improvement process.
- (9) Zero-defects day—create an event that will let all employees know, through personal experience, that there has been a change.
- (10) Goal setting—turn pledge and commitment into actions, by encouraging individuals to establish improvement goals for themselves and their groups.
- (11) Error cause removal—give the individual employee a method of communicating to management the situations that make it difficult for the employee to meet the pledge to improve.
- (12) Recognition—appreciate those who actively participate.
- (13) Quality councils—bring together the professional quality people for planned communication on a regular basis.
- (14) Do it over again—emphasize that the quality improvement process never ends.

**Table 3.** *Salient characteristics of Crosby's approach*

|                                |                                                              |                                                                    |
|--------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Supply-led                                                         |
|                                | Main emphasis                                                | Conformance to requirements/performance                            |
|                                | Dominant factor                                              | Zero defects                                                       |
|                                | Scope of application                                         | Implicitly functional                                              |
|                                | Applicability—sector                                         | Manufacturing emphasis                                             |
| B. External interface          | Customer focus                                               | Implicit in customer requirements                                  |
|                                | Market focus (environment)                                   | Not addressed                                                      |
|                                | Vendor/buyer relationship                                    | Not specified                                                      |
| C. Organizational context      | Primary change agent                                         | Top management                                                     |
|                                | Top management role                                          | To understand costs of quality, to promote zero defects            |
|                                | Management style                                             | Instructional, promotional                                         |
|                                | Organization culture                                         | Quality as an organizational culture                               |
| D. Organizational requirements | Top management commitment                                    | Essential                                                          |
|                                | Employee involvement/participation                           | Essential                                                          |
|                                | Education and training                                       | Essential                                                          |
|                                | Investment in non-human resources                            | Not specified                                                      |
| E. Means/ techniques, etc.     | Costs of quality (appreciated)                               | Important, to motivate management                                  |
|                                | Training programmes                                          | Training and motivational programme, including 'zero-defects' days |
|                                | Participation feedback (e.g. communication, quality circles) | Teamwork on zero defects; consultation on problems                 |
|                                | Statistical methods                                          | Not specific, but measuring results is stressed                    |
|                                | Recognition/rewards systems                                  | Recognize and reward those who achieve quality (zero-defect) goals |
|                                | Inspection procedures                                        | Not stressed                                                       |
|                                |                                                              |                                                                    |
| F. Change                      | Pace of change                                               | Gradual                                                            |
|                                | Nature of change                                             | Sequential (though ordering of steps may vary)                     |

Table 3 depicts the key characteristics of Crosby's approach.

#### *Feigenbaum's approach to quality*

Feigenbaum defines quality as the "total composite product and service characteristics of marketing, engineering, manufacture and maintenance through which the product and service in use will meet the expectations of the customer" (Feigenbaum, 1986). This definition recognizes that quality is a multi-dimensional entity and there are trade-offs between various individual quality characteristics. He argues that the product/service quality is dynamic in nature because customers' expectations are subject to change. Thus, it is imperative for the management to recognize that the balance between various individual quality characteristics is subject to temporal variations. Furthermore, quality cannot be separated from product cost.

He states that total quality management (TQM) covers the full scope of the product and service 'life cycle' from product conception through production and customer service. The key elements of the 'TQM and control' propagated by Feigenbaum are briefly discussed here.

The quality chain, he argues, starts with the identification of all customers' requirements and ends only when the product or service is delivered to the customer who remains satisfied.

Thus, all functional activities such as marketing, design, engineering, purchasing, manufacturing, inspection, shipping, accounting, installation, and service, etc., are involved in and influence the attainment of quality. Effective 'total quality control', therefore, requires a high degree of functional integration. Furthermore, it guides the coordinated actions of people, machines and information to achieve quality goals.

The 'total quality control', he claims, consists of four main stages. These are:

- (1) setting quality standards;
- (2) appraising conformance to these standards;
- (3) acting when standards are not met;
- (4) planning for improvements in these standards.

The emphasis is on the prevention of poor quality rather than detecting it after the event. He argues that quality is an integral part of the day-to-day work of the line, staff and operatives of an organization. It cannot be effectively separated from other activities undertaken by employees and any attempt to do so more than likely would result in substandard quality.

He, like most other gurus, considers effective staff training and education as an essential component of TQM. He states that education and training should address the three vital areas of:

- (1) quality attitudes;
- (2) quality knowledge;
- (3) quality skills.

Feigenbaum's distinctive contribution is to recognize that all quality approaches are synergistic (Chase & Aquilano, 1989). This means that quality improvements need to be applied to all aspects of operations. The system is only as strong as its weakest link. The key features of Feigenbaum's approach are shown in Table 4.

#### *Grocock's approach to quality*

Grocock's definition of quality is a synthesis of Crosby's 'conformance to requirements' and Juran's 'fitness for purpose'. He states that "the quality of a product is the degree of conformance of all of the relevant features and characteristics of the product to all of the aspects of a customer's need, limited by the price and delivery he or she will accept" (Grocock, 1986). This is a value-led definition. It explicitly recognizes that there is a trade-off between the quality of a product and its price.

Based on his experience in industry, Grocock argues that quality needs to be made an organizational priority because product quality superiority enhances competitiveness. Like Deming and Feigenbaum, Grocock recognizes that meeting customer expectations creates a need to improve quality continually to match readjusted expectations. This is achieved through the 'chain of quality'. This is a 'chain of conformance' throughout the life of a product, from marketing, design and purchasing to manufacturing processes.

Grocock emphasizes that at each part of the chain, specific determinants of conformance to customer needs should be built in. Much of this emphasis on conformance to requirements echoes Crosby.

Top management commitment, employee involvement, and education and training are all considered essential. Grocock proposes the use of various techniques to develop quality, for example SPC for the manufacturing part of the chain. He advocates 'competitor quality evaluation' as a means of determining quality to the customer, and 'system quality audits' to assess the organization's quality levels.

Table 4. *Salient characteristics of Feigenbaum's approach*

|                                |                                                              |                                                                            |
|--------------------------------|--------------------------------------------------------------|----------------------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Customer-led                                                               |
|                                | Main emphasis                                                | Process                                                                    |
|                                | Dominant factor                                              | Principles of total quality control = methodology                          |
|                                | Scope of application                                         | Holistic and integrative                                                   |
|                                | Applicability—sector                                         | Manufacturing emphasis, but also applies to services                       |
| B. External interface          | Customer focus                                               | Customer ultimately defines quality                                        |
|                                | Market focus (environment)                                   | Quality as competitive advantage                                           |
|                                | Vendor/buyer relationship                                    | Close relationship for quality assurance                                   |
| C. Organizational context      | Primary change agent                                         | Top management                                                             |
|                                | Top management role                                          | To promote total quality control; as designer of Q programme               |
|                                | Management style                                             | Participative                                                              |
|                                | Organization culture                                         | Spirit of 'quality mindedness'                                             |
| D. Organizational requirements | Top management commitment                                    | Essential                                                                  |
|                                | Employee involvement/participation                           | Involvement and support essential/integral                                 |
|                                | Education and training                                       | Essential—to promote company-wide 'quality mindedness'                     |
|                                | Investment in non-human resources                            | An integral component of total quality control                             |
| E. Means/ techniques, etc.     | Costs of quality (appreciated)                               | Integral to business strategy, planning, investment, programming           |
|                                | Training programmes                                          | Customized to fit circumstances, quality problem centred                   |
|                                | Participation feedback (e.g. communication, quality circles) | Essential, e.g. via quality circles and quality of working life programmes |
|                                | Statistical methods                                          | As appropriate, useful, but only part of TQC pattern                       |
|                                | Recognition/rewards systems                                  | Recognition via participation of employees for commitment to quality       |
|                                | Inspection procedures                                        | Improved by total quality programmes                                       |
|                                |                                                              |                                                                            |
| F. Change                      | Pace of change                                               | Gradual                                                                    |
|                                | Nature of change                                             | Step by step, starting with selected areas                                 |

Grocock's approach to quality improvement is modelled on Crosby's 14-step programme, with reservations about the value of pursuing 'zero defects'. He also suggests a longer period for reflection (or review) at the end of the programme rather than embarking on the same sequence straight away.

Grocock stresses the 'people' factors in quality. Quality circles and other participatory methods are endorsed, where appropriate.

The key characteristics of Grocock's approach are summarized in Table 5.

#### *Taguchi's approach to quality*

Taguchi defines quality as the "loss imparted to the society from the time a product is shipped". Examples of loss include: (a) failure to reach ideal performance; (b) failure to meet customer's requirements; (c) breakdowns; and (d) harmful side-effects caused by products (Taguchi, 1986). Thus, the smaller the loss, the more desirable is the product. The aim of

**Table 5.** *Salient characteristics of Groocock's approach*

|                                |                                                              |                                                                                     |
|--------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Value-led                                                                           |
|                                | Main emphasis                                                | Process                                                                             |
|                                | Dominant factor                                              | Chain of conformance                                                                |
|                                | Scope of application                                         | All processes                                                                       |
|                                | Applicability—sector                                         | Manufacturing                                                                       |
| B. External interface          | Customer focus                                               | Focus on customers needs                                                            |
|                                | Market focus (environment)                                   | Quality to achieve market superiority/competitiveness                               |
|                                | Vendor/buyer relationship                                    | Multiple vendors—need to be quality assured                                         |
| C. Organizational context      | Primary change agent                                         | Top management                                                                      |
|                                | Top management role                                          | Promote and champion quality                                                        |
|                                | Management style                                             | Implied—participative                                                               |
|                                | Organization culture                                         | Corporate ethics—quality and honesty                                                |
| D. Organizational requirements | Top management commitment                                    | Essential (as Crosby)                                                               |
|                                | Employee involvement/participation                           | Essential (as Crosby)                                                               |
|                                | Education and training                                       | Essential, preferably by in-house quality staff                                     |
|                                | Investment in non-human resources                            | Implicit in approach to quality costs (defect prevention)                           |
| E. Means/techniques, etc.      | Costs of quality (appreciated)                               | Need to institutionalize quality cost improvements                                  |
|                                | Training programmes                                          | Important, including human skills (e.g. for quality circles)                        |
|                                | Participation/feedback (e.g. communication, quality circles) | Essential (as Crosby)—communication and information flows                           |
|                                | Statistical methods                                          | Emphasis on statistical process control                                             |
|                                | Recognition/rewards systems                                  | Recognition stressed, non-monetary rewards                                          |
|                                | Inspection procedures                                        | Inspection and test in manufacturing are essentials for product quality improvement |
| F. Change                      | Pace of change                                               | Gradual, with special 'zero-defects' days (as Crosby)                               |
|                                | Nature of change                                             | Sequential and repeatable                                                           |

quality control is to reduce the total cost to society, and the function of quality control is to discover and implement innovative techniques that produce net savings for the society. Implicit in Taguchi's philosophy is the premise that "in a competitive economy, continuous quality improvement and cost reduction are necessary for remaining in business".

The key elements of Taguchi's quality concepts are briefly stated below.

- (1) Quality improvement should concentrate on reducing the variation of the product's key performance characteristics about their target values.
- (2) The loss suffered by a customer due to a product's performance variation is often approximately proportional to the square of the deviation of the performance characteristics from its target value.
- (3) The final quality and cost of manufactured products are determined to a large extent by the engineering design of the product and the manufacturing process.
- (4) A product's or process's performance variation can be reduced by exploiting the non-linear effects of the product or process parameters on the performance characteristics.

**Table 6.** *Salient characteristics of Taguchi's approach*

|                                |                                                              |                                                                                |
|--------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Supply-led—value to society                                                    |
|                                | Main emphasis                                                | Reducing variation of product process around target values                     |
|                                | Dominant factor                                              | Control quality to minimize total cost to society                              |
|                                | Scope of application                                         | Off-line in design and on-line in production                                   |
|                                | Applicability—sector                                         | Manufacturing emphasis                                                         |
| B. External interface          | Customer focus                                               | Implicit in customer requirements and society as a whole                       |
|                                | Market focus (environment)                                   | Reducing society's loss                                                        |
|                                | Vendor/buyer relationship                                    |                                                                                |
| C. Organizational context      | Primary change agent                                         | Management                                                                     |
|                                | Top management role                                          | Creating a continuous improvement ethics                                       |
|                                | Management style                                             | Participative                                                                  |
|                                | Organization culture                                         | Continuous improvement                                                         |
| D. Organizational requirements | Top management commitment                                    | Essential                                                                      |
|                                | Employee involvement/participation                           | Essential                                                                      |
|                                | Education and training                                       | Essential                                                                      |
|                                | Investment in non-human resources                            | Essential                                                                      |
| E. Means/techniques, etc.      | Costs of quality (appreciated)                               | Important to define and minimize—explicitly identified                         |
|                                | Training programmes                                          | Enhance knowledge and understanding of employees. Train in statistical methods |
|                                | Participation/feedback (e.g. communication, quality circles) | Quality circles, teamwork                                                      |
|                                | Statistical methods                                          | Taguchi methods of process control                                             |
|                                | Recognition/rewards systems                                  | The need for recognition recognized                                            |
|                                | Inspection procedures                                        | Continuous measurement—operatives responsibility                               |
|                                |                                                              |                                                                                |
| F. Change                      | Pace of change                                               | Gradual                                                                        |
|                                | Nature of change                                             | Continuous improvement in acceptable levels of variation                       |

- (5) Statistically planned experiments can be used to identify the settings of product/process parameters that reduce performance variation.

Taguchi concepts can be applied off-line in design or on-line in production. He argues that 100% conformance as suggested by Crosby or Grocock is impractical, while it is possible to reduce continuously the variation of key performance characteristics around the target value. His method can play an important role in the implementation of the total quality control management, particularly in the manufacturing organizations.

Table 6 depicts the key characteristics of Taguchi's approach.

#### *Ishikawa's approach to quality*

Ishikawa defines quality as the "development, design, production and service of a product that is most economical, most useful, and always satisfactory to the consumer". He argues that quality control extends beyond the product and encompasses after-sales service, quality of management, quality of individuals and the company itself (Ishikawa, 1985). In this

respect, there is strong similarity between his views and those of Feigenbaum and Grocock. Ishikawa strongly advocates the deployment of 'quality circles'. In his work, like all other gurus, he emphasizes the importance of education.

He states that **quality** begins and ends with education. In his view, every employee should be taught the seven basic tools of quality. These are:

- Process flow charting—what is done.
- Check sheets/tally charts—how often it is done.
- Histograms—what overall variations look like.
- Pareto analysis—which are the significant problems.
- Cause-and-effect analysis—what causes the problems, and brain storming.
- Scatter diagrams—what are the relationships between factors.
- Control charts—which variations to control and how.

The salient characteristics of Ishikawa's approach are summarized in Table 7.

**Table 7.** *Salient characteristics of Ishikawa's approach*

|                                |                                                              |                                                                                                       |
|--------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| A. General                     | Definition of quality                                        | Value-led                                                                                             |
|                                | Main emphasis                                                | Individual quality                                                                                    |
|                                | Dominant factor                                              | Perceived consumer value                                                                              |
|                                | Scope of application                                         | Holistic                                                                                              |
|                                | Applicability—sector                                         | Manufacturing emphasis, but also applies to services                                                  |
| B. External interface          | Customer focus                                               | Integral to quality definition and management<br>Quality—an important source of competitive advantage |
|                                | Market focus (environment)                                   |                                                                                                       |
|                                | Vendor/buyer relationship                                    |                                                                                                       |
| C. Organizational context      | Primary change agent                                         | Top management                                                                                        |
|                                | Top management role                                          | To promote quality on a company-wide basis and across all functions                                   |
|                                | Management style                                             | Participative—open communications                                                                     |
|                                | Organization culture                                         | Continuous improvement—learning organization                                                          |
| D. Organizational requirements | Top management commitment                                    | Essential                                                                                             |
|                                | Employee involvement/participation                           | Essential                                                                                             |
|                                | Education and training                                       | Essential for all employees                                                                           |
|                                | Investment in non-human resources                            | As a part of overall quality drive                                                                    |
| E. Means/ techniques, etc.     | Costs of quality (appreciated)                               | Improvement in quality reduces other costs                                                            |
|                                | Training programmes                                          | Essential. All employees should be competent in statistical process control and problem-solving       |
|                                | Participation/feedback (e.g. communication, quality circles) | Advocate of quality circles as a means for participation and problem-solving                          |
|                                | Statistical methods                                          | Statistical process control                                                                           |
|                                | Recognition/rewards systems                                  | Quality behaviour and performance to be rewarded                                                      |
|                                | Inspection procedures                                        | Inspection part of operatives role, essential in manufacturing                                        |
|                                |                                                              |                                                                                                       |
| F. Change                      | Pace of change                                               | Gradual                                                                                               |
|                                | Nature of change                                             | Continuous improvement                                                                                |

### Comparing the gurus

The approach of various gurus was reviewed in the previous sections. In this section, we examine the similarity and the differences between various approaches.

#### *Points in common*

While each of the gurus on quality has his own distinctive approach, there is much common ground in what they say and propose. These points are discussed below.

- (1) The importance of controlling the process and not the product.
- (2) The importance of not forgetting the human process. This is as vital, if not more so, than the control of the technical process.
- (3) That top management is responsible for quality and not the workforce. It is management's responsibility to provide commitment, leadership, and the appropriate support to technical and human processes. Thus, it is imperative that management has a clear understanding of the process.
- (4) That management determines the climate and framework of operations within the organization. It is imperative that management fosters the participation of the workforce (and maybe others such as vendors and buyers) in quality improvement, and develops a 'quality' culture by changing perception of, and attitudes towards, quality.
- (5) The importance of education and training is emphasized in changing employees' beliefs and attitudes and enhancing their competencies in carrying out their duties.
- (6) The emphasis is on prevention of product defects, not inspection after the event, and on the reduction of the costs of quality to improve competitiveness.
- (7) That quality improvement is emphasized, producing benefits over time, whether developed continuously or project by project. Quality is not a programme but a process, and not an instant cure.
- (8) There is a broad agreement that all aspects of activities should be looked at for quality improvement, as these all contribute towards quality. Functional integration is considered as an important ingredient of TQM.
- (9) Quality is a company-wide activity.

Table 8 shows a comparison between the gurus' approaches using three key factors.

**Table 8.** *Comparing the gurus—summary of approaches*

| Guru       | Definition                         | Emphasis       | Dominant factor                              |
|------------|------------------------------------|----------------|----------------------------------------------|
| Deming     | Customer-led                       | Process        | Control of variation                         |
| Juran      | Customer-led                       | People         | Fitness for purpose/use                      |
| Crosby     | Supply-led                         | Performance    | Conformance requirements/zero defects        |
| Feigenbaum | Customer-led                       | Process        | Total quality control                        |
| Groocock   | Value-led                          | Process        | Chain of conformance                         |
| Ishikawa   | Value-led                          | People         | Company-wide quality control/quality circles |
| Taguchi    | Supply-led—<br>value to<br>society | Process/design | Quality loss function                        |

*Shortcomings and limitations*

The approaches propagated by gurus have shortcomings. Garvin (1987), Chase and Aquilano (1989) and others have commented on various gaps in these approaches to quality. These include the lack of a conceptual framework and of a 'sound instructional methodology' to help organizations of different types examine quality, in particular to identify which aspects of quality matter, how much is needed, and how to establish customers' needs satisfactorily. While Deming, Juran, Crosby and others have been strong on what is broadly needed, including detailed techniques, they offer little guidance of immediate and direct value or relevance to organizations. It is difficult to connect the general quality concepts and ideas to these specific circumstances of an organization—to its markets, management practices and workforce. All the various approaches to quality, of the gurus or others, are appropriate, depending on the circumstances. It is important that organizations do not apply the methods suggested by the gurus rigidly and in a formulaic fashion. They need to examine the methods and match them to the specific requirements of their organization.

*Quality is not a 'quick fix' solution*

This underlines a crucial danger common to the quality approaches outlined above. They cannot be taken simply at face value, and implemented wholesale as an 'off the shelf' quick fix solution to the company's problems. Yet, this was a problem apparent during the 1980s—as Crosby calls it, 'I've got a hammer, where are the nails' or the 'silver bullet' approach to quality (Karabatsos, 1989).

*Directions for future research*

Deming, Juran Crosby and Feigenbaum have all been aware of these dangers. For example, Deming stressed that his 14 steps are not 'tablets of stone', but guidelines to be adopted as appropriate to the circumstances and needs of the company seeking to develop a quality approach.

The concepts of quality discussed above have been developed in the context of manufacturing operations to a large extent, even if the service aspects of such operations are explicitly referred to as contributing to quality. The development of the 'total quality' approach, in particular since the 1980s, have encouraged the translation of these ideas to service operations. This, in turn, has provided the context for the increased interest in applying quality ideas and concepts to public sector service organizations, for example in the UK via the government's Citizens' Charter initiative.

It is suggested that the next steps for research, using the quality approaches of the gurus, is to attempt to match each approach, or component, to circumstances and features of organizations. For example, Deming's emphasis on minimizing variation suggests goods and services where reliability is paramount. Juran's emphasis on teamwork, and on a step-by-step approach to quality improvement via breakthrough projects, appears well-suited to services, especially 'high contact' services (Chase, 1978; Haywood-Feather, 1988).

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