Chapter 6

W. Edwards Deming

A prophet is not without honour, save in his own country.
(Matthew 13:57)

KEY LEARNING POINTS

***W. Edwards Deming's definition of quality*: a function of continuous improvement based on reduction in variation around the desired output.**

Seven Deadly Sins and Diseases:

- lack of constancy;
- short-term profit focus;
- performance appraisal;
- job-hopping;
- use of visible figures only;
- excessive medical costs;
- excessive liability costs.

Five key beliefs: quantification; recognition of failure causes; systematic approach; continuous improvement; constancy.

Principal methods: fourteen principles for transformation; the seven-point plan

INTRODUCTION

W. Edwards Deming, who died in 1994, is considered by many to be the founding father of the quality movement. He is perhaps the most widely known of the gurus, both within and outside the quality field. Deming held a doctorate in physics from Yale and was a keen statistician, working in the US government for many years in the Department of Agriculture and the Bureau of Census. According to Bendell (1989: 4), Deming rose to prominence in Japan,

where he was closely involved in (and, Bendell suggests, largely responsible for) the post-war development of quality there. Heller (1989) sees Deming as having a 'passionate belief in man's ability to improve on the poor and the mediocre, and even on the good', a belief which, as we shall see, is evident in both his theory and his practice. Logothetis (1992: xii) sees Deming as advocating 'widespread use of statistical ideas, with management taking a strong initiative in building quality in'. Bank (1992: 62) cites Hutchins's belief that a major contribution made by Deming to the Japanese quality movement was in helping them 'to cut through the academic theory, to present the ideas in a simple way which could be meaningful right down to production worker levels'.

Summarizing, Deming's approach can be seen as founded in the traditional scientific method (arising from his physics and statistics background). He was also a very capable communicator. Although, as Bendell (1989: 5) suggests, it is 'difficult to delimit his [Deming's] concepts', owing to the constant refinement and improvement of his ideas, his successful and widely read book *Out of the Crisis* (1986) presents his approach to both management and quality in its most succinct, coherent form.

6.1 PHILOSOPHY

Deming's initial approach, largely rejected by US industry at the outset, was based on his background in statistical methods. His quantitative method provided a 'systematic, rigorous approach to quality' (Bendell, 1989: 4). Drawing on the work of the statistician Walter Shewhart, his tutor, Deming urged a management focus on causes of variability in manufacturing processes.

Deming's first belief can be seen here, that there are 'common' and 'special' causes of quality problems. 'Special' causes are those relating to particular operators or machines and requiring attention to the individual cause. 'Common' causes are those which arise from the operation of the system itself and are one of the responsibilities of management.

Deming believed in the use of statistical process control (SPC) charts as the key method for identifying special and common causes and assisting diagnosis of quality problems. His aim was to remove 'outliers' – that is, quality problems relating to the special causes of failure. This was achieved through training, improved machinery and equipment, and so on. SPC enabled the production process to be brought 'under control'. Remaining quality problems were considered to be related to common causes – that is, they were inherent in the design of the production process. Eradication of special causes enabled a shift in focus to common causes to improve quality further.

Deming's second belief is apparent here, a quantitative approach to identifying and solving problems. It is suggested by Bendell (1989: 4) that this statistically based approach brings its own problems. He reports lack of technical standards and limitations of data, and, perhaps more importantly, 'human difficulties in the form of employee resistance and management lack of understanding as to their roles in quality improvement', particularly in the US applications. Bendell considers that perhaps 'too much emphasis was being given towards the statistical aspects'. It can be suggested that Deming's approach reflects to a significant degree the 'machine' view of organizations outlined in Chapter 4. It is also fair to make two further observations. First, the normal level of learning about statistics for most of us does not proceed

beyond the age of 16; our grasp of the subject is usually tenuous and we often find it hard to understand fully what the results achieved really mean. Second, given contemporary information technology, the results which Deming's methods reveal could be presented more meaningfully. As is also true of other experts in their respective fields, the value of Deming's work could be obscured by our ability to interpret it.

Notwithstanding these problems, Deming became a national hero in Japan and his methods were widely taken up. In 1951, the Deming Prize for contributions to quality and dependability was launched, and in 1960 he was awarded the Second Order of the Sacred Treasure, Japan's premier Imperial honour.

A third strand to Deming's work was the formulation of his systematic approach to problem solving, an approach which is now commonplace and frequently reinterpreted in other methodologies – for example, the EPDCA cycle in Oakland's work (see Chapter 10) – and is central to the application of the ISO 9001:2000 standard. This has become known as the Deming, Shewhart or PDCA cycle – Plan, Do, Check, Action – which is illustrated in Figure 6.1. The cycle is continuous. Once it has been systematically completed, it recommences without ceasing. This is in agreement with Crosby's admonition, already considered, to 'Do it all over again.' The approach is seen as re-emphasizing the responsibility of management to be actively involved in the organization's quality programme, while Logothetis (1992: 55) considers that it provides the basis for a 'self-sustaining quality programme'.

Two further beliefs can be derived here. First, Deming believes in a systematic, methodical approach contrasting sharply with the *ad hoc* and random approach found in many quality initiatives. The second belief is in the need for continuous quality improvement action. This contrasts sharply with the overtones in Crosby's approach, which suggest a discrete set of activities.

Deming's later work focused on Western, and particularly US, management. Here Deming (1986: 97–148) elaborated seven fundamental beliefs (the 'Seven Deadly Sins' – Box 6.1) about bad management practices which he considered must be eliminated before Western styles of management could be transformed to support the implementation of a successful quality initiative.

Sin 1, 'lack of constancy', is seen by Logothetis (1992: 46) as urging 'an absolute and constant commitment on the part of senior management to quality, productivity and innovation'. Inherent in this is a continuing drive towards better quality and reliability of product in

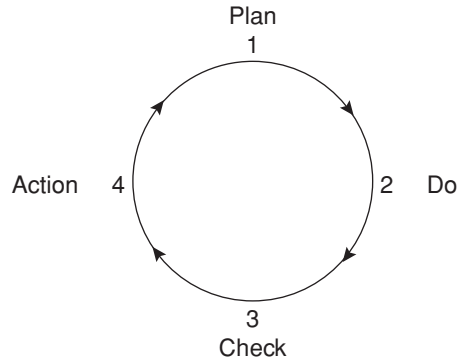

Figure 6.1 *W. Edwards Deming's Plan, Do, Check, Action cycle*

Box 6.1 *The 'Seven Deadly Sins', according to W. Edwards Deming*

Sin 1	Lack of constancy
Sin 2	Short-term profit focus
Sin 3	Performance appraisals
Sin 4	Job-hopping
Sin 5	Use of visible figures only
Sin 6	Excessive medical costs
Sin 7	Excessive costs of liability

order to drive down costs, protect investment and employment, create and enlarge markets, and hence generate more jobs. It is seen as providing a positive and achievement-oriented focus for the organization. Deming (1986: 98) criticizes management, particularly in US industry, for being 'run on the quarterly dividend'. It is certainly true that today ever more organizations throughout the world are managed according to the 'flavour of the month', with senior managers flitting from miracle solution to miracle solution while more junior managers keep their heads down and wait for the passion to pass.

Sin 2, 'short-term profit focus', is seen as challenging and potentially defeating the 'constancy of purpose' previously urged. Deming (1986: 99) suggests that

> Anyone can boost the dividend at the end of the quarter. Ship everything on hand, regardless of quality: mark it shipped, and show it all as accounts receivable. Defer till next quarter, so far as possible, orders for material and equipment. Cut down on research, education, training.

Here, Deming is making clear his belief in a management approach with a long-term orientation. He gives explicit recognition to the need to satisfy shareholder expectations, but points out that these expectations must go beyond the immediate return on capital to consider the long-term future of the organization. Much criticism has been levied in recent years at what is now known as 'short-termism' in the City of London, on Wall Street, in Exchange Square or Raffles Place. The underlying reasons and causes are not the subject of this book, but readers may wish to consider issues such as the increasing ownership of shares by financial institutions and the difficulties of making money by making products in a harsh business environment. Pension and investment companies are frequently the largest stockholders in public companies; it is worth thinking about their requirements and the reward packages of their employees, which are often tied to short-term performance measures.

Sin 3, performance appraisal, is considered by Deming (1986: 102) to 'nourish short-term performance' and 'leave people bitter, crushed, bruised, battered, desolate, despondent, dejected, feeling inferior' – a somewhat damning indictment. Logothetis (1992: 47) sees appraisal as encouraging 'rivalry and isolation' and demolishing teamwork, again leading back to a focus on individual and short-term results, noting that 'people who attempt to change the system (for the better) have no chance of recognition'.

While acknowledging Deming's belief in the potential damage that a poor appraisal system can cause, this is rather more a function of a badly designed system than a necessary outcome of performance review. As with the quality of a manufactured product, the quality and impact of an appraisal system will depend upon the quality of its design. Most of us need and enjoy recognition of our achievements and can benefit from the guidance delivered through a constructive and effective appraisal system. This benefit perhaps partly reflects the esteem element in Maslow's hierarchy of needs.

Job-hopping – regular movement of management between jobs either within or between organizations – is the fourth sin. Originally seen as a particular attribute of Western management, this has been increasingly common in Far East locations such as Singapore and Hong Kong, although recent economic reversals in those and other Asian economies have challenged the trend. Job-hopping is considered to lead to instability and further reinforce the short-term orientation of the organization. Logothetis (1992: 39) suggests that it destroys teamwork and commitment, and ensures that many decisions are taken in whole or partial ignorance of the circumstances surrounding them. The belief this time is in the need for commitment on the part of management to the long-term future of the organization.

Sin 5 is 'the use of visible figures only'. Here Deming criticizes failure to recognize and evaluate the intangible aspects of the organization – for example, the additional sales generated through satisfied customers, the benefits to productivity and quality derived from people feeling part of a success story and the negative impact of performance appraisal or barriers to achieving quality. Deming (1986: 123) considers that managers who believe that everything can be measured are deluding themselves and suggests that they should know before they start that they will be able to quantify only 'a trivial part of the gain'. This should be seen as a belief in intangible, invisible benefits arising from good management practice. It does, however, conflict with his espousal of statistical methods, since the reliable measurement of intangibles is notoriously difficult. Lessons could perhaps be drawn here from organizational psychology, which can help to measure some of the aspects that Deming considered intangible, and by re-examining the organizational and financial structure of the organization, which often obscures where the true profits and costs arise.

The sixth and seventh sins revealed by Deming are given little attention by other writers on his work. His points are simply made. The sixth sin, medical costs, both direct in lost labour costs and indirect in the sense of medical insurance premiums, are met largely by the employer. Thus they are an additional cost to be recovered in the price of the product. According to Deming (1986: 98), William Hoglund of the Pontiac Motor Division informed him that the direct cost of medical care to the company exceeded the amount spent on steel for every vehicle produced!

The cost of insurance is driven by claims experience and actuarial expectation, and it is arguable whether Deming is making a fair point here. Medical costs are currently covered in every developed nation. If they are not supported by private insurance schemes such as prevail in the United States, France, Singapore and many other nations, they may be met by a national scheme such as the National Health Service in the United Kingdom. Either way, the company may be considered to bear the cost, through direct contribution, or by increased basic wages which enable the employees to meet the cost themselves. For example, in the United Kingdom, employees receiving an appropriate level of income pay between 7 per cent and 10 per cent

of their wages into a National Insurance scheme intended to cover the costs of primary health care and provision of a state pension. In addition, employers pay a contribution of around 10 per cent of total salary costs into the same scheme on behalf of the employees. It is doubtful whether there is any real difference in the cost related to this between employers in the United States and those in the United Kingdom.

The seventh and final sin is one that now seems to be gaining further ground – that is, 'liability costs'. There is evidence throughout the developed world of an increasingly litigious public, perhaps encouraged by lawyers working on a 'no win, no fee' basis. While many potential liability issues are insurable, many others are not. The costs of these must be borne by the organization. Whether management and manufacturers can reasonably be blamed for this issue is certainly arguable and it is questionable whether it is within their power to control it effectively. It is suspected that it relates to broader societary changes such as an increasing trend towards individual rather than collective values and the hunt, whenever things go wrong, for the often elusive 'someone to blame'.

Summarizing Deming's philosophy, we can identify a number of clear strands. There are evident beliefs in:

- quantitative, statistically valid, control systems;
- clear definition of those aspects under the direct control of staff – that is, the 'special causes' – and those which are the responsibility of management – 'the common causes'. Deming suggests that these are as high as 94 per cent!;
- a systematic, methodical approach;
- continuous improvement;
- constancy and determination.

Taken together, these cover the first five of his 'Deadly Sins'. The other two are highly arguable.

Along with Crosby, Deming (1986: ix) considers that quality should be designed into both the product and the process. He believes that 'transformation of the style of American [sic] management' is necessary, requiring a 'whole new structure, from foundation upward'.

6.2 ASSUMPTIONS

The assumptions about the world that Deming seems to make in order to underpin his approach will now be explored.

First, it can be seen that while the approach initially focuses attention on existing processes to derive immediate improvement – the eradication of 'special causes' of failure – it is rapidly refocused to the management process and attitudes. Deming seems to believe that these must be, in his own words, 'transformed' in order for sustained improvement to be achieved. The management is seen to be responsible and, significantly, to be capable of undertaking the proposed transformation. He does not suggest, in organization design terms, how this should be achieved.

Second is the assumption that statistical methods, properly used, will provide quantitative evidence to support changes. At the same time, he recognizes that some aspects cannot be

easily measured, and suggests that managements frequently fail to take seriously those aspects which they consider unmeasurable.

The third key assumption is that continuous improvement is both possible and desirable. Taking his definition of quality as 'meeting the needs of the customer, both present and future' (1986: 5), this has to be questioned. If the needs of the customer are fully understood and fully met, where is the benefit in further improvement?

A further aspect to this is perhaps more significant in the new millennium. The assumption is that continuous improvement supported by an orientation towards the long term will enable the organization to meet customers' 'future needs'. If, however, the contemporary world is characterized, as Handy (1990a) suggests, by 'discontinuous change', then a long-term view and continuous improvement may no longer be enough. Perhaps organizations must be built which can anticipate and prepare for sudden, maybe catastrophic, change. The Compaq example in Chapter 3 illustrates the point: continuous improvement and incremental change may not be sound recipes in a discontinuous world. The 'boom and bust' of the supposed new economy dotcom businesses is another example. While many of these businesses were undoubtedly built on weak foundations, many others should have been capable of survival. The inevitable collapse of the weak brought down many of the strong.

Deming's final assumption, as with Crosby, is about the service sector. Simply, he sees that the prime role of the service sector, in the context of a national economy, rests in enabling manufacturing to do its job. He suggests (1986: 188), for example, that

> A better plan for freight carriers would be to improve service and thus to decrease costs. These cost savings, passed on to manufacturers and to other service industries, would help American industry to improve the market for American products, and would in time bring new business to carriers of freight.

While offering specific advice in the same text about quality improvement in the service sector, Deming, unlike Crosby, does explicitly recognize the difficulty of measuring certain aspects of it. He seems also to assume an initially altruistic effort which contrasts sharply with his accusations of short-termism. To some extent, he is possibly correct: cost savings should be passed back down the chain, and in a systemically developed solution this could occur. Such a move, though, is probably more a function of truly competitive and open markets rather than an altruistic or collaborative gesture.

The implications of his assumption about the role of services should also be considered. As suggested in Chapter 1 (Vignette 1.1), it can be observed that few local communities thrive when their manufacturing base is lost. For example, the shipbuilding and coal-mining communities in the United Kingdom suffer from major economic difficulties, social fragmentation and mass unemployment. Notably, many service sector jobs and organizations can now be clearly seen to have depended upon local manufacturers through the direct purchase of services by the major organizations and the expenditure of wages by the employees. The wealth generated by the employer was in large part expended in the same community. As the manufacturing sector has declined, so too has the service sector.

Those sectors where services have continued to thrive are in areas of specialist technical expertise such as banking, insurance, finance and other knowledge-based industries. These industries

have a less dependent relationship on the manufacturing sector than, say, retailing and real estate. Notwithstanding these particular aspects, there is perhaps a warning at a national and multinational level. If individual communities cannot be adequately sustained when manufacturing is lost to them, then is there any future for nations if their manufacturing base as a whole is lost?

6.3 METHODS

Deming has four principal methods:

- the PDCA cycle;
- statistical process control;
- the fourteen principles for transformation;
- the seven-point action plan.

The first of these has been introduced already and will not be dealt with further here. The second, statistical process control (SPC), is briefly explained below. The fourteen principles for transformation and seven-point action plan will provide the major content of this section.

SPC is a quantitative approach based on measurement of process performance. Essentially a process is considered to be under control – that is, stable – when its random variations fall within determined upper and lower limits. That is seen by Deming as the process having achieved a position where the special causes of failure have been eradicated.

A control chart, a sample of which is provided in Figure 6.2, is used to record the value of a measurement associated with an event in a process. Statistical analysis of the values recorded will reveal the mean value. Normal variation from this mean value for the particular process in its established state is conventionally taken as any value within ± 3 standard deviations of the mean. Events which fall outside that normal variation are considered 'special' and should prove tractable to individual diagnosis and treatment. Events falling within the norms are considered to have 'common' causes – that is, they are a product of the organization of the system and require treatment at the system level. Here we can refer directly to Deming (1986: 315) and re-emphasize the role of management in the development of quality:

> I should estimate that in my experience most troubles and most possibilities for improvement add up to proportions something like this:
>
> 94% belong to the system (responsibility of management)
>
> 6% special.

It has to be acknowledged here that Deming's split of special and common causes, and consequently his allocation of responsibility for error, relates directly to the product of SPC. At ± 3 standard deviations in a stable system, it is inevitable that 95 per cent of errors will belong to the system – 95 per cent is only 2 standard deviations in a normal distribution. Three standard deviations (approximately 99.7 per cent of results) are recognized through SPC as representing stability – the system is under control. The standard (± 3 sigma) was originally devised by Shewhart to minimize net economic loss from rectifying mistakes, the objective of Taguchi's 'quadratic loss function', to be elaborated in Chapter 12.

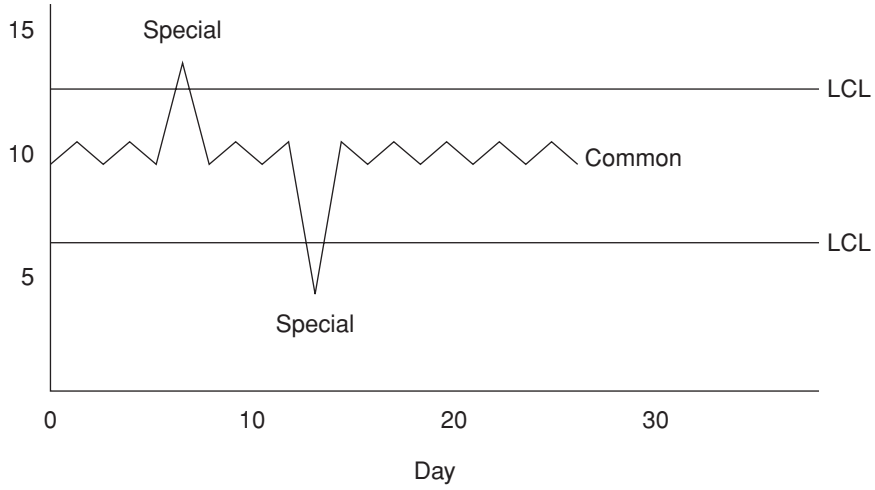

Figure 6.2 *Sample control chart. LCL and HCL are the lower and upper confidence limits, respectively*

Box 6.2 *W. Edwards Deming's fourteen principles for transformation*

Principle 1	Create constancy of purpose to improve product and service
Principle 2	Adopt a new philosophy for the new economic age, with management learning what their responsibilities are and assuming leadership for change
Principle 3	Cease dependence on mass inspection to achieve quality, by building quality into the product
Principle 4	End the awarding of business on price; award business on total cost and move towards single suppliers
Principle 5	Aim for continuous improvement of the system of production and service to improve productivity and quality and to decrease costs
Principle 6	Institute training on the job
Principle 7	Institute leadership with the aim of supervising people to help them to do a better job
Principle 8	Drive out fear so that everyone can work effectively together for the organization
Principle 9	Break down barriers between departments. Encourage research, design, sales and production to work together to foresee difficulties in production and use
Principle 10	Eliminate slogans, exhortations and numerical targets for the workforce since they are divisory, and anyway difficulties belong to the whole system
Principle 11	Eliminate quotas or work standards and management by objectives or numerical goals; leadership should be substituted instead
Principle 12	Remove barriers that rob people of their right to pride in their work
Principle 13	Institute a vigorous education and self-improvement programme
Principle 14	Put everyone in the company to work to accomplish the transformation

We can now turn to the first main focus of this section, Deming's fourteen Principles for Transformation (Box 6.2). These, like Crosby's fourteen steps, are essentially straightforward and rely on a combination of statistical and human, or cultural, aspects. The principles will be reviewed in turn.

The first three principles – creating constancy of purpose, adoption of a new philosophy and ceasing dependence on mass inspection – may all be seen as focused on the cultural aspects of the organization. The first principle is aimed at creating a 'team' type of environment where all are working together towards a common goal. It requires the management to commit themselves to achieving ever-improving quality as a primary objective of the organization. The story of the regeneration of Kennet School (Vignette 6.1) illustrates this point.

The second principle, that of embracing management learning and a leadership-based style of management, concerns acceptance by the management that the responsibility for developing and achieving the changes is theirs. It requires explicit recognition by management that the workers are not necessarily to blame for quality deficiencies. This may well require a dramatic change in both words and actions on the part of management, particularly if they have been accustomed, as so many are, to pushing the blame down through the hierarchy.

The third principle, ceasing dependence on mass inspection by building quality into the product, requires a further dramatic change in management approach and has major implications for issues such as organization structure and information management. A simple abandonment of mass inspection not supported by changes in other aspects will potentially be disastrous. A successful example of such a change is the introduction in recent years of

VIGNETTE 6.1 **KENNET SCHOOL: A TALE OF CONSTANCY AND DETERMINATION**

Until January 1989, Kennet School presented a disappointing picture. The lack of coherence and consistency in support to the teachers constrained them from exploiting their talents and abilities. While some pupils performed exceptionally well, certain parents perceived the school as a 'glorified youth club' – somewhere to send the children to keep them occupied while they, the parents, were out at work. Limited leadership was in evidence: there was little communication between members of staff, parental complaints were ignored and the buildings were neglected. The school was suffering a falling pupil roll, threatening the sixth form of only 90 pupils with closure. In measured performance terms, only 28 per cent of pupils obtained five or more passes at grades A–C in the General Certificate of Secondary Education (GCSE) examinations – a dismal record.

In 2001, despite the provision of extra buildings, the school is practically at capacity in pupil numbers and the sixth form is thriving. The 2000 examination results show 63 per cent of pupils obtaining five or more GCSE passes at grades A–C. The standards attained by the school led to it being listed in early 1997 as outstanding in examination results and inspection. Kennet School is one of only 63 secondary schools in England and Wales recognized in this way, and the only school in West Berkshire.

The achievement of this turnaround has been through 'constancy and determination' rather than the use of a 'miracle cure', or the adoption of any particular guru's methodology. The new headmaster appointed in 1989 adopted a 'classical' approach to management in the early days. He imposed discipline on both the children and the staff, letting 'nothing go by that [he] didn't like'. Development and imposition of rules and standards for staff and children was immediate. These covered issues such as movement, behaviour, uniform and homework, and were supported by action on his part. The smooth functioning of the school now rests on these rules, which received high visibility at the outset. A staff handbook is in use which sets out the aims of the school and is supported by clarity of responsibility, with everyone now knowing 'who is responsible for what'.

The priority of the school is academic excellence. Sporting success (a regular achievement) and pastoral issues are regarded as important in supporting the academic objectives, the means to achieve educational ends, rather than ends in themselves. The creation of an 'inner cabinet' chaired by the headmaster emphasizes this priority. The cabinet consists of the heads of the eleven academic faculties within the school, together with one head of house. This unbalanced representation confirms in action the words of the headmaster – 'walking the talk'!

The headmaster recognized that some 'early wins' were required to ensure that his different way of running the school would be perceived as correct. Ten members of staff left in the first three years, some voluntarily, some less so. Two children were expelled. There was necessarily some conflict during those early days, and while there was much discussion with the people affected, the head held, and still holds, an absolute veto on all matters – although he exercises extreme caution in using it. He recognizes the need to achieve a balance between making things happen and doing everything himself – a possible outcome of an autocratic approach.

With a system of rules in place and acceptance by the staff of the new way of working, much of the decision-making power has been passed to the heads of departments (notwithstanding the headmaster's veto). Their decisions (as well as those referred to the headmaster) rest on one simple question: 'What is the benefit in the classroom?' If there is no benefit, then the proposal will fail. The criterion for the introduction of new ideas or approaches is simply educational benefit.

Creation of a three-year rolling development plan for the school is undertaken by the heads of departments and their staff and subjected to a 'round robin' process of modification and refinement. Every member of staff receives a copy of the completed plan. The final column of the plan shows who is responsible for which aspects – making accountability open and public. The senior staff undertake a review and refocusing of the plan at termly intervals.

The school, now managed in a much more decentralized manner, with trust given to staff and pupils wherever possible, still adheres to three global targets:

- continuous improvement in academic standards;
- staff development;
- improved behavioural standards and sustained improvement in the environment of the school.

In the words of the headmaster, 'There is so much more to do.'

multidisciplinary product development teams in organizations such as John Deere Tractors. These teams include both design and production engineers so that products are now designed with production requirements in mind rather than having to be re-engineered for production. This speeds up the development of new products, reduces manufacturing complexity and leads to improved quality. Other major manufacturing companies are following the same route.

The fourth principle, that of no longer awarding business on the basis of price rather than total cost, is a recognition that the invoiced unit price of a sub-assembly or part is only a fraction of its total potential cost (or value) to the organization. For example, a part which has the lowest unit cost may carry with it a high level of rejects. This leads to either high inspection costs to identify poor-quality parts or a poor quality of finished product, leading in turn to high inspection and rework costs, and potential for product failure in the hands of the customer.

A number of aspects need to be considered in the identification of the total cost of a purchased item. These may include unit cost, quality (failure and reject rate), inspection costs, inventory costs (for example, the potential for implementing a 'just-in-time' or kanban system) and ease of use in the manufacturing environment – that is, the impact of the supplied item on labour and other costs. The other aspect which must be considered is the purchase of items which support the manufacturing process such as machine tools, conveyor systems and control systems. Particularly with these latter items, the ongoing running costs are often a far greater part of the total lifetime cost than the initial purchase price. Significant benefits can be obtained by bearing a higher initial cost in order to generate longer-term savings. A prime example of this is with Mercedes cars. While the initial capital cost of buying a Mercedes is significantly greater than for competitors' equivalent models, the Mercedes is reputed to depreciate at a far lower rate (under 40 per cent over the first three years life compared to more than 60 per cent) than vehicles made by those competitors, and with greater component reliability and longevity also has lower running costs (although many other manufacturers are now achieving comparable levels of performance).

Deming also recommends a move towards single suppliers. As with so many things, this approach has both advantages and drawbacks. The principal advantages are that it provides the purchaser with significant leverage in negotiating improvements in product quality and price, it enables long-term relationships based on trust and mutual support, and it provides a more secure financial platform for the provider. Conversely, reliance on a single source of parts supply makes the purchaser vulnerable to any failure on the part of the supplier, either financially or in quality. Such exposure may give cause for concern to bankers and other financiers. A worthwhile approach here would be to consider the use of a single supplier based on Porter's (1980) model for competitive rivalry. Where supplier power is weak (there are many suppliers and the product is undifferentiated or non-critical), a single-supplier strategy may bring significant benefits to the company, enabling it to take effective control of its supplier. Where supplier power is strong (there are few suppliers, the product is differentiated or critical), the organization may maximize its position by supporting more than one supplier.

The fifth principle, aim for continuous improvement, if considered appropriate to the customer's needs and industry circumstances, gives greater substance and focus to the first two by focusing attention on productivity, quality and decreasing costs. Objectives at this stage can be made more quantifiable, moving from the ideals of the first principles to a more practical, achievement orientation.

The sixth principle, on-the-job training, emphasizes the need to improve competencies and skills in the practical context. While not excluding classroom-based training, this principle suggests that the objective of continuous improvement applies at least as much to people as it does to processes.

The seventh principle, leadership, is again qualitative and cultural, and is closely associated with the eighth, 'drive out fear'. These principles are connected with the management style of the organization. The objective here can usefully be seen as a requirement to move away from an adversarial style of management towards a collaborative style. Effective management in this way, supported by the SPC techniques, will focus attention on how to improve the individual (special causes) or the system (common causes), rather than on who to blame. The approach will again target curing the diseases rather than convicting the victims.

The ninth principle, that of breaking down barriers, can be seen as linked to the fourth. The suggestion here is, in effect, for the creation of multidisciplinary teams for product and service development, aiming to enhance the development, production and delivery of new products or services. Deming does not discuss how this can be achieved or specifically recognize the difficulties that can be associated with it. There are a number of cultural and professional issues which often emerge in the creation of multidisciplinary teams, and any reorganization into either a matrix form of management or project teams needs to be associated with commensurate changes in salary and bonus packages to enable congruence of individual and organizational goals.

The tenth principle, 'eliminate slogans, exhortations and numerical quotas', is again more a cultural than a quantitative statement. Here Deming is suggesting that these features act more to vex the staff than to encourage them. His argument is simple. If through the use of SPC the 'special causes' of failure related to individual machines and workers have been removed, then all other causes of failure relate to the system itself. These are seen as the responsibility of management, so no amount of slogans, exhortations and quotas will have any positive effect. Instead, Deming (1986: 67) suggests, they will 'generate frustration and resentment'. This principle clearly links to the second, which required management to accept their responsibilities.

The eleventh principle, 'eliminate quotas, work standards and management by objectives or numerical goals and substitute leadership', seems to be something of a contradiction. Improvement targets must be an inherent part of measuring and monitoring achievement, and statistical process control provides one form of measurement of achievement. However, Deming's point here is that if the system is stable, as will be revealed by the control charts, then its performance cannot be improved by the setting of targets, only by changes to the system. As with slogans and exhortations, Deming sees the setting of targets and quotas as potentially both meaningless and divisive unless accompanied by a specific action plan to improve the process. This may well mean reappraising what the system is designed to achieve.

Removal of barriers that rob people of their right to pride in their work is the twelfth principle. Deming distinguishes management and workers from each other here. He sees that annual appraisal or merit review focuses the attention of management on the matters that will be covered in the appraisal or merit system. He implies that they will strive to achieve those things regardless of the impact on quality or productivity – that is, they will do the right thing by the appraisal system, not by the customer!

The workers he sees as being constrained by uncertainty of employment, by lack of definition as to what constitutes acceptable workmanship, by poor-quality materials, tools and machines, and by ineffective supervision and management. He suggests that if these aspects are corrected, then quality products will follow. Deming (1986: 85) suggests, 'Give the work force a chance to work with pride, and the 3 per cent that apparently don't care will erode itself by peer pressure.' He seems to ignore the idea that the whole organization of many factories, based on the principles of classical management theory, is established (whether or not intentionally) to remove pride in achievement from the workers by fragmenting tasks.

Principle 13 is to institute a vigorous education and self-improvement programme. This is Deming's recognition that if the organization is to continuously improve, then the people must continuously improve. He suggests that future competitive advantage will be achieved through knowledge, a conclusion that there can be little argument with.

The fourteenth and final principle is to put everyone to work to achieve the transformation. This suggests that the whole programme can be successful only if a 'total' approach is taken. This will require a strong, unified and cohesive culture within the organization with commitment from top to bottom. Such a culture can be achieved only when the behaviour of management is consistent with their words – that is, when they 'walk the talk'.

Taken together, these principles can be summarized as proposing wholesale attitudinal change throughout the organization (a qualitative approach), supported where appropriate by reliance on validated statistical analysis (quantitative).

To enable the principles to be implemented, Deming proposed a seven-point action plan (Box 6.3). This action plan is perhaps best interpreted as a series of statements about what to do, rather than the more important question of how to do it. Its first three points clearly focus attention on the top management group and are based on attitudes and communication. They suggest that this group must understand what they are trying to achieve, commit themselves to a successful outcome and then communicate to subordinates throughout the organization

Box 6.3 *W.Edwards Deming's seven-point action plan*

Point 1	Management must agree on the meaning of the quality programme, its implications and the direction to take
Point 2	Top management must accept and adopt the new philosophy
Point 3	Top management must communicate the plan and the necessity for it to the people in the organization
Point 4	Every activity must be recognized as a step in a process and the customers of that process identified; the customers are responsible for the next stage of the process.
Point 5	Each stage must adopt the 'Deming' or 'Shewhart' cycle – Plan, Do, Check, Action – as the basis of quality improvement
Point 6	Team working must be engendered and encouraged to improve inputs and outputs; everyone must be enabled to contribute to this process
Point 7	An organization for quality must be constructed with the support of knowledgeable statisticians

why it is necessary. This has distinct overtones of Crosby's more directly evangelical approach and reflects what can be thought of as the ethical aspect of the programme – that is, the need for quality to be embraced in the values and beliefs of *all* members of the organization. It can surely be agreed that if the management are not wholly committed to the programme, and are unable or unwilling to communicate it effectively to the workforce, who must similarly accept it, then it will not work.

The fourth point recognizes the process-based work flow of most organizations and calls for the processes to be divided into stages. Each stage becomes a clear task, with the recipients of its outputs being treated as its customers. Thus at every stage there are customers whose needs must be identified and satisfied. This can be seen as an attempt to overcome the problem of workers in many processes, for example in the manufacture of sub-assemblies. These staff are often unaware of customers and do not recognize the sub-assembly as a product in its own right, but rather see it as a part of a larger product which perhaps they never see. It is suggested that this shift of emphasis enables workers to take a pride in their work that is otherwise absent.

The fifth point is simply to implement continuous improvement at every stage through the PDCA cycle. Achievement of implementation in this way implies acceptance, by both management and workers within each process, of responsibility for the process. This in turn implies that higher management must allow them authority to develop and implement the changes.

The next point, participation in team work to improve all inputs and outputs, can be seen to operate at several levels. First, a team culture must be developed within each process to improve it internally. Second, since changes in one area may have implications in another, a team culture must be engendered between process owners (the management) to enable effective communication between them. Third, to be truly effective, a means of sharing and developing improvements across processes must be developed. This links the whole programme back to top management.

The seventh point, construction of an organization for quality, is perhaps a further development of the third part of stage 6, improvement across processes. The requirement is to build an organization which reflects and nurtures the achievement of quality. Perhaps reflecting his own background, Deming suggests the use of knowledgeable statisticians to support this aspect. It is useful to go well beyond this and propose the support of a multidisciplined team of management scientists and experts such as cyberneticians, psychologists, statisticians and accountants to work with the management team in the pursuit of the programme, thereby emphasizing the collaborative nature of achieving quality. It is not suggested that the management scientists develop and impose a programme of change; such a course of action would be almost certainly doomed to failure. It is suggested rather that the management and workers should be responsible for the whole programme, having both control and ownership. The role of the management scientists is to use their expertise in a supportive, guiding manner, as experts within the team.

The introduction to Deming's approach is now complete. SPC and methodologies for implementing quality will be addressed in the appropriate chapters. This section is concluded by reaffirming that while initially Deming's approach was rooted in quantitative methods, it later came to be supported by more qualitative techniques.

6.4 SUCCESSES AND FAILURES

While overall Deming can be said to have been very successful in his achievements, there have been both successes and failures. His movement into Japan, for example, was to some extent a result of the early rejection of his ideas by American managements. This perhaps reflects the maxim that 'a prophet is not without honour, save in his own country'. It was only after his substantial successes with Japanese industry that Deming was able to turn his attention again to the problems of industrial America.

Here, what Flood (1993: 14) calls Deming's fundamentally 'mechanistic' approach ran into 'strong workforce resistance, from both the managers and the workers'. Deming, taking account of these issues, together with matters of reliance on technology, standards of practice and the cultural issues, substantially revised his methods. The change is reflected in the shift in emphasis from quantitative to qualitative approaches and in the codification of the 'Seven Deadly Sins'.

According to Flood (1993), the principal strengths of Deming's approach are:

- the systemic logic, particularly the idea of internal customer–supplier relationships;
- management before technology;
- emphasis on management leadership;
- the sound statistical approach;
- awareness of different socio-cultural contexts.

Significant weaknesses are also recognized:

- lack of a well-defined methodology;
- the work is not adequately grounded in human relations theory;
- as with that of Crosby, the approach will not help in an organization with a biased power structure.

Reviewing the strengths, the value of the systemic and logical approach cannot be denied. Put simply, it is an organized and systematic rather than chaotic approach. The 'Plan, Do, Check, Action' cycle as a mechanism for organizational learning is recognized in other areas of management as a 'learning cycle'. Handy (1985), for example, refers to a process of:

- questioning and conceptualization – fundamental parts of effective planning;
- experimentation – trying out ideas, the testing and evaluation of hypotheses;
- consolidation – the alteration of habits, the basis for future action.

Handy sees this as the basis of human learning – that is, continuous personal improvement. It is unsurprising that a similar process works for organizations, which, after all, have people as their fundamental organizational units. This cycle will be seen echoed in Chapter 19 on organizational learning.

Deming's prioritization of management before technology represents a reversal of the attitudes of many managers. The British adage that 'a bad workman always blames his tools'

recognizes that the tendency for most managers is to look at external rather than internal factors as responsible for failure. If, as Deming suggests, 94 per cent of problems belong to the management, then acceptance by them of responsibility is a primary step in enabling change. Equally, even the worst tools can be made to perform better in the hands of a good workman, but a bad workman will not achieve good performance however good the tools.

The recognition of the importance of leadership and motivation can be seen to reflect the development of human relations theory as a major strand of management thinking, although Deming does not draw heavily on the body of knowledge that became established in that area during his productive years.

Regarding the strong quantitative base, perhaps Flood does not go far enough, and it could be suggested that some form of measurement system, whether relying on hard, physical measures or on softer aspects using techniques from organizational psychology, is fundamental to achievement of quality. A simple attempt to 'do better' will always be followed by questions such as 'how much' or 'when'. Vagueness on these issues would be expected to have a dispiriting effect on the participants, while a form of achievement target orientation would be motivational. Success is said to breed success, but first of all it must be known that success is being achieved!

The recognition by Deming of different cultural contexts is a vital strength. His failure to draw heavily on the literature of human relations theory for this aspect suggests that his embrace of it was driven by pragmatism rather than desire, perhaps a reluctant recognition that it was necessary to allow the other ideas to work. Nonetheless, the recognition of different cultures, and adaptation to them, are essential in achieving success. Hofstede (1980) produced theprincipal work in this area. In the context of quality, the recognition needs to go well beyond the country differences highlighted by Hofstede to recognize the particular culture of organizations themselves, and even sections, functions and departments within organizations. These frequently have unique, perhaps very strong, cultural contexts.

Flood's criticism of a lack of a clear 'Deming method' can be seen as reasonably well justified. Like many gurus and experts, Deming suggests what to do without indicating very precisely how to do it. While perhaps constraining on the one hand, this lack of precision can be seen as potentially disemprisoning and empowering. It encourages experimentation and debate within each individual context to find an approach which will work there rather than using an approach which was developed in another time and context. Perhaps the most important issue is reliance on Deming's principles.

The second weakness having been covered within the strengths, the third can be examined. Deming is criticized for saying nothing about intervention in political and coercive situations. Perhaps, following the previous point, nothing needs to be said. The second principle and the first three points of the action plan all call on management to accept their responsibility for quality and productivity and to embrace a new philosophy. These remarks are targeted directly at the most senior members of the management team – that is, those who hold power in a political or coercive context. If they do not accept responsibility at the outset, they are ignoring the principles, and, by default, not following the Deming method. If they seek to impose a quality approach on others, failure will certainly follow. Deming's whole approach rests on the attitude of management.

6.5 CRITICAL REVIEW

The foundation of Deming's approach can be seen in his statistical background and his training in the science of physics. These essentially 'hard' sciences based in scientific method will have informed the development of his early approaches. It must be acknowledged that they continue to make a major contribution to work in the field of quality.

The principles and practice of SPC have been demonstrated over time to have considerable value to organizations in both the service and manufacturing sectors. They also have value for the workers who use them, providing rapid and personal performance feedback information, enabling them to recognize their own successes and failures and to take corrective action where appropriate, provided always that the outputs are expressed in a language which they can understand.

Deming's work in relation to the softer issues is considered to be narrow and underdeveloped, failing to take account of much of the thinking in that area over the period of his career. It must, though, be acknowledged that Deming did not claim to be an expert in this area. Nevertheless, the value of his approach could have been further enhanced by a clearer focus on that aspect.

The Plan, Do, Check, Action cycle is a clear directive to both management and workers that achieving continuous improvement is the purpose of the quality activity. This contrasts directly with the hints of a discrete programme suggested in Crosby's work.

Deming makes quite clear reference to the service sector in his work, but again places much emphasis on quantitative aspects of this area. For example, he refers to aspects such as how long a telephone is out of action before it is repaired. While this is of great importance, of equal importance is the tone of voice which a person uses in answering the telephone when it rings. This may be a stronger determinant of how the customer perceives the level of service quality than the number of times that it rings, or even the words that are said – readers will recall the comment on this issue in the Chapter 5.

It is often the case that managers take measurements of the things which are easy to measure, rather than the things which, while difficult to measure, are of greater importance. In a world which relies ever more heavily on telecommunications devices, these aspects, which are more difficult to quantify, will have increasing importance. The reliability and clarity of modern digital telecommunications systems are such that these are no longer significant issues, and many businesses are run entirely through them – for example, telephone-based banking and insurance services. Of increasing importance, then, is tone of voice, since technical issues are less problematic and digital technology makes tone of voice transparent to the listener. The more recent development of videophone technology and Internet telephony, which are not yet widespread, will have further impacts on this area of service.

It is accepted that Deming has probably made the most substantial contribution to quality management. However, enthusiasm must be tempered with the knowledge that if he had provided a clearer method, a more explicit and developed recognition of the human aspects, and a precise focus on what constitutes quality of service in the contemporary world, the value of his work would have been enhanced.

SUMMARY

This chapter has presented the main strands of the work of W. Edwards Deming through the five-point critical framework. Readers wishing to develop their knowledge further should read the relevant chapters in Part four of this book and refer to Deming's own work, in particular *Out of the Crisis* (1986).

QUESTION

Deming suggests that 94 per cent of quality problems are the responsibility of management. Review this statement.