

CHAPTER 11

W. EDWARDS DEMING (1900–1993)

MILAN ZELENY

Wisdom sounds foolish to fools.

Euripides

IN MEMORIAM

W. EDWARD Deming died on 20 December 1993. During the course of his lengthy career, Deming uncovered American executives' fatal weaknesses: their lack of relevant education, lack of relevant theory, and lack of relevant knowledge. He found that their world was naively experiential, reduced to perpetuation or lukewarm pseudo-improvement of the status quo. He made them pay for his expertise, charging fees of as much as \$100,000 a year to a single client; not because he needed the money but because, as he once said, 'How else could these people judge they were getting something of importance?' His contempt was as profound as his knowledge.

His engagement with American business came late in the day. Although Deming was American at heart, his first official consulting encounter with a bona fide US company (Ford at Dearborn, MI) came in February 1981. Until then, quality, Japan, and most of all Deming were not acknowledged or taken seriously in the US. ('We were not quite sure what to make of him', admitted James F. Bakken from Ford Motor Co.) Deming refused to have anything to do with companies not willing to make top executives available to him (his was a sizeable majority in the US).

Deming never built a formal organization, consulting group, or other money-making venture (unlike Juran, Crosby, Peters, and similar gurus). He more closely resembled that other lone, original, and influential personality of US management, Peter F. Drucker. He was formally associated with New York University (from 1946), where Ernest Kurnow later pushed through the faculty a non-mathematical course based on Deming's

fourteen points of management; he also regularly lectured at Columbia University. At Fordham University, Deming presented many lectures, advised on the business school curriculum, received an honorary doctorate, and left a sizeable number of devoted disciples.

FORMATIVE YEARS

W. Edwards Deming was born on 14 October 1900, in Sioux City, Iowa, into an old, pre-Revolutionary War family of the Norwegian stock. His father was a part-time lawyer and land developer in Powell, Wyoming. His father's name was also William, so Deming went by his middle name Edwards (the maiden name of his mother). Deming's studies included engineering at the University of Wyoming in Laramie, mathematics and physics at the University of Colorado, and a Doctorate in Physics from Yale University in 1928. Deming described his student years at Wyoming University at Laramie as 'Those Lean Years'. There lies the beginning of his 'lean management', his embodied experiences from 1917. Moving from Powell to Laramie was a 'step into the big world' experience for the 17-year-old.¹ He immediately started looking for a job—at the top—by calling on the President of the University, Dr Aven Nelson. That got him to help the head janitor, in five different odd jobs during the week.

As was the work, so was the education: too much time was spent on so-called practical work. His field was electrical engineering, but Deming complains: 'We spent too much time in manipulating tools of one kind or another—chipping, filing, hacking, sawing, gluing, and learning various arts and trade such as mechanical drawing and descriptive geometry. What we should have been doing was to spend more time on electrodynamics, thermodynamics, mathematics, English, French, German and basic subjects like economics, which I had to fill in later.' Deming was also a musician: he played flute and drums and composed music throughout his life, including sacred choral compositions and an arrangement for *The Star Spangled Banner*. Deming married Agnes Bell in 1922, but she died in 1930, after they had adopted a daughter, Dorothy (died in 1984). Deming married Lola Elizabeth Shupe in 1932 (with her he co-authored several papers), had two more children, Diana and Linda. Lola died in 1986. During his employment at AT&T's Hawthorne manufacturing plant in Chicago, Deming was crucially influenced by Dr Walter Shewhart of Bell Labs, a pioneer in the use of statistics to control manufacturing processes. Shewhart's teachings and books formed the main base of Deming's philosophy. During the mid-1930s, Deming studied statistics (on a one-year leave of absence from the Agriculture Department) with Sir Ronald Fisher of the University of London.

¹ See Deming, W. Edwards, "Those Lean Years at Wyoming U." First published by the University of Wyoming, 1965; website for W. Edwards Deming Institute. Accessed 27 May 2012 at <<http://deming.org/index.cfm?content=63>>.

This must have been one of his proudest moments. In the 1930s, Deming designed the sampling techniques for the US Census Bureau.

During World War II Deming applied statistics to the production of supplies for the US military. While working under Gen. Douglas MacArthur as a census consultant to the Japanese government, he famously taught statistical process control methods to Japanese business leaders, returning to Japan for many years to consult and to witness economic growth that he had predicted would come as a result of applying techniques learned from Walter Shewhart. Later, he became a professor at New York University while engaged as an independent consultant in Washington, DC. There, in 1993, he founded the W. Edwards Deming Institute, where the Deming Collection at the US Library of Congress includes an extensive audiotape and videotape archives. The aim of the Institute is to foster understanding of the Deming System of Profound Knowledge to advance commerce, prosperity, and peace.

What is at the core of Deming's teaching? Certainly not statistical charts or so-called quality control techniques, even though he had taught about their misuse and misapplication. He rarely mentioned computers, technology, or telecommunications. He had very little to say about organizations, ownership, corporate governance, or management hierarchies. His main message was simple and quintessentially American: restore joy and satisfaction to work. Abolish annual ratings, merit systems, and performance appraisals—all foreign stuff to the American spirit of self-reliance, self-help, and neighbourly cooperation. Firms must rely on employees working cooperatively with management for quality improvement. No other dependable resource is available for such purpose.

In July 1950, the Union of Japanese Scientists and Engineers (JUSE) invited him to present a series of lectures at the Eight-Day Course on Quality Control seminar, organized by JUSE. His lecture notes were assembled in a book, *Elementary Principles of the Statistical Control of Quality*. Among his other books are *Out of the Crisis* and *Quality, Productivity, and Competitive Position*. The Deming Prize was instituted in 1951 by a formal resolution of the JUSE Board of Directors in grateful recognition of Dr Deming's friendship and his achievements in the cause of industrial Quality control, as proposed by the late Mr Kenichi Koyanagi, a board member and one of the founders of JUSE. Funding of the Deming Prize began with the donation by Deming of the royalties received from the sale of the Japanese edition of his *Theory of Sampling*. There has never been any Deming Prize in the US. Instead, we have a Malcolm Baldrige National Quality Award. (Malcolm Baldrige was Secretary of Commerce from 1981 until his death in a rodeo accident in July 1987. He took a personal interest in the Quality Improvement Act.)

In 1956 Deming received the Shewhart Medal from the American Society for Quality Control, and in 1960 Japan's Order of the Sacred Treasure, Second Class, from Emperor Hirohito. The citation on the medal recognizes Deming's contributions to Japan's industrial rebirth and its worldwide success. Later, from his home in Washington, DC, Deming continued running his own consultancy business in the United States, still unknown and largely unrecognized in his country. In 1980, he was featured in an NBC documentary titled *If Japan can... Why can't we?* As a result of

this broadcast, demand for his services increased dramatically. He continued consulting until his death at the age of 93.

In 1990 Deming wrote: 'What I took to Japan was not export of American practice. I took to Japan profound knowledge of a system. I taught management and engineers in Japan manufacturing as a system. The Western world still does not understand a system and optimization thereof.'

This was Deming's great insight: Americans do not understand *systems* and they do not understand *optimization*. For some reason, which I had the privilege of discussing with Deming, by systems they came to understand rigid classification structures (and charts), not the circularly concatenated *processes* in their dynamic interdependence.

By optimization, for some reasons, they have come to understand maximization or minimization of a *single* function (like profits, costs, or utility). Yet, by definition, any optimization must involve *balancing* multiple independent and interdependent functions. As Deming said, optimization does not, and cannot, mean purchasing everything at its lowest price.

Deming's final and crucial concept is that of *profound knowledge*. Americans are often afraid even of the word 'profound'. Their knowledge can be useful, pragmatic, sufficient, conventional, or carnal, but profound? How many courses teaching knowledge are there? How many professors teach knowledge (action itself) rather than simply re-packaging information (description of action)? How many people still confuse knowledge with information?

Americans, even during Deming's heydays, still believed that there exists a trade-off between cost and quality, that better quality meant higher cost, and that consumers did not want to pay for higher quality products. This attitude survived well into the eighties, although it appears to be rapidly disappearing now.

Deming is all about systems, optimization, and profound knowledge. On the contrary, his disciples and interpreters are often about statistical charts, slogans, advocacy consulting, and quantitative measurements. One cannot optimize a given system; one has to design a system which *is* (by its very function) optimal. There is no point in inspecting and correcting for defects within a given, inferior system: the system processes have to be *redesigned* so that they produce better quality *without* inspecting and correcting. 'How simple!' Deming would say. One cannot improve product quality by improving the inspectors.

The fact is that management cannot learn from experience on the job. Nor can they learn at school. In fact, anyone could pass with high marks all the regular courses offered in colleges and universities in business, statistics, and engineering, yet come off with not the faintest idea about how to improve quality, productivity, and competitive position.

Measurements of productivity, like assorted measurements of quality, do nothing about productivity as they do nothing about quality. Measurements simply measure. Like accident statistics, they can do little about accidents. 'The consumer is the most important part of the production line'. The consumer *is a part of* the production line, Deming implies, not just an external target of slogans (about being a 'king').

Fourteen points for management

Quality focus brings forth natural consequences for management practice. Once we put quality into our strategic focus, the entire business/management model has to be adjusted to support the new orientation. Deming's fourteen key principles were presented in 1986, in his *Out of the Crisis* (pp. 23–24). Of course, one can find the fourteen points much earlier, especially in his 1982 book *Quality, Productivity, and Competitive Position* (MIT, Center for Advanced Engineering Study, pp. 16–17). The following are Deming's fourteen points, annotated for today's conditions, where useful:

1. Create constancy of purpose toward improvement of product and service, with the aim to become competitive and stay in business, and to provide jobs.

Creation of jobs is stated here as one of the purposes of business. This provision is becoming harder and harder to sustain in an automated, productivity oriented, mature economy. Today we would say that company embedded and embodied innovation is the key to sustainable business.

2. Adopt the new philosophy. We are in a new economic age. Western management must awaken to the challenge, must learn their responsibilities, and take on leadership for change.

Originally, Deming insisted that we can no longer live with commonly accepted levels of delays, mistakes, defective materials, and defective workmanship. Well, we still do: just look at Toyota and its monster recalls in recent years. Western management has not responded to the challenge and has not welcomed the new economic age. Instead of embracing the change, it has become more conservative, passive, and defensive of the traditional ways: even responsibilities for job creation are being delegated to the government.

3. Cease dependence on inspection to achieve quality. Eliminate the need for massive inspection by building quality into the product in the first place.

Mass inspection should cease, but it did not. Statistical evidence that quality is built in remains meagre and unreliable. Quality cannot be 'inspected in.' More precisely, rather than building quality into the product, it should be built into the process itself. Quality of the process ensures quality of the product, not vice versa.

4. End the practice of awarding business on the basis of price tag. Instead, minimize total cost. Move towards a single supplier for any one item, on a long-term relationship of loyalty and trust.

A meaningful measure of product quality should include its price. The one-dimensional business practices—based on singular objectives (like price, cost, profit, utility, etc.) must be replaced by proper multidimensional thinking: multiple criteria decision-making, not single-minded 'measurement and search', are at the core of good business.

How can we teach a single supplier (the prerequisite of loyalty and trust) to deliver a multidimensional, product or service free of trade-offs, remains the challenge even today.

5. Improve constantly and for ever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

Management's job is to work continually on improving the system, not just work within the system. Constant improvement of the system can be interpreted as improvement or change of the business model: not only to improve its efficiency, but to continually upgrade its effectiveness. Recall the differences between efficiency, effectiveness, explicability, and productivity. Improving quality leads to lower costs if and only if the costs are seen as a dimension of quality.

6. Institute training on the job.

Training 'off the job' is clearly insufficient. Training on the job engages people in action and generates knowledge. Training off the job (especially case studies) engages people in description of action only, that is, generating information only. One cannot run business by managing information: one has to manage human knowledge.

7. Institute leadership. The aim of supervision should be to help people and machines and gadgets to do a better job. Supervision of management is in need of overhaul, as well as supervision of production workers.

The responsibility of supervisors must change from sheer numbers to quality. Leadership is to replace traditional supervision. Supervision, like inspection, comes too late. Quality embedded in the process does not have to be inspected in, and knowledge embodied in humans does not have to be supervised over. We are still far from the 'overhaul' recommended and called for by Deming.

8. Drive out fear, so that everyone may work effectively for the company.

Traditional management is based on and thrives on fear. Employees are afraid of losing their jobs, position, and income—and so they conform to threats and pressures. No trust or loyalty is created that way, only their illusions. If you are after efficiency only, fear could be an effective servant; if you are also after effectiveness, fear could be an ineffective master. A self-sustainable company cannot be based on fear.

9. Break down barriers between departments. People in research, design, sales, and production must work as a team, to foresee problems of production and in use, that may be encountered with the product or service.

With the emergence of teamwork, process management, demand chains, and cross-disciplinary communication for action, some of the most oppressive intracorporate walls have started to come down. That allows us to foresee rather than forecast, bringing strategic foresight into the centre of corporate grasp of the environment.

10. Eliminate slogans, exhortations, and targets for the work force asking for zero defects and new levels of productivity. Such exhortations only create adversarial relationships, as the bulk of the causes of low quality and low productivity belong to the system and thus lie beyond the power of the work force.

This is a 'non-brainer'. Constancy of purpose cannot and does not mean setting of quantitative goals. Quantitative goals are the only things which are not and should not be constant. Targets and goals have little to do with optimization as balancing of multiple objectives. Bad systems need exhortations and slogans (Enron's walls were covered with such props), while good systems have their values embodied in action and do not need to display their descriptions on corporate walls. It does not matter what you say: the only thing that matters is what you do.

11.
 - a. Eliminate work standards (quotas) on the factory floor. Substitute leadership.
 - b. Eliminate management by objectives. Eliminate management by numbers, numerical goals. Substitute leadership.

As long as work standards are quantitative exhortations, they remain ineffective. Either the system allows and motivates setting of higher levels of achievements, or it does not. In the first case, standards and norms are naturally and continually surpassed; in the second case, no level of sloganeering will change the system. Substituting leadership means working on the system (towards continuous change) and not in the system, that is, accepting its limitations and doing one's best under the worst conditions.

12.
 - a. Remove barriers that rob the hourly worker of his right to pride of workmanship. The responsibility of supervisors must be changed from sheer numbers to quality.
 - b. Remove barriers that rob people in management and in engineering of their right to pride of workmanship. This means, inter alia, abolishment of the annual or merit rating and of management by objectives

The pride of workmanship has to be instilled in people and enhanced by the system. When such pride is destroyed and replaced by externally supervised goal setting, then you have a mindless machine, rather than a self-managing corporate organism. Excessive specialization is at the root of knowledge atomization; dispersion and destruction of knowledge is directly related to the loss of pride, professionalism, and self-confidence.

13. Institute a vigorous programme of education and self-improvement.

Education and self-improvement must be aimed at restoring the lost pride, sense of profession, and human autonomy. Overly dependent and narrow specialists cannot manage and motivate others. They are driven by the system instead of driving the system themselves. Corporate entrepreneurial university, devoted to knowledge enhancement and action, should replace the reliance on traditional acquisition of information.

14. Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job.

Corporate transformation cannot take place just at the top. That is of course necessary, but certainly not a sufficient condition. Transformation concerns the whole system and all of its components. Transformation is a matter of systemic adaptation, not of social engineering.

It should be obvious that Deming's fourteen points are not being taken as an unchanging dogma, but as a living, never ending and always evolving experiment. Massive corporate re-education and training is required to instil the courage to break with traditional habits. Each company has to achieve this on its own; each company has to create its own business model and its own system of management. Every activity and every job is a useful part of such process. No bureaucrat or auditor of norms can replace such a process.

Dr Deming was clearly a vocal critic of performance appraisals, as evidenced in his point 11. He even called annual ratings a disease, annihilating long-term planning, demobilizing teamwork, nourishing rivalry and politics, leaving people bitter, crushed, bruised, battered, desolate, despondent, unfit for work for weeks after receipt of rating, unable to comprehend why they are inferior, and so on. His answer to what could possibly replace performance appraisals was one word: leadership. Myron Tribus echoed Deming's sentiments in his 'Perversity Principle': If you try to improve the performance of a system of people, machines, and procedures, by setting numerical goals for the improvement of individual parts of the system, the system will defeat your efforts and you will pay a price where you least expect it.²

OTHER VERSIONS OF DEMING'S POINTS

Joseph M. Juran

In personal meetings and discussions, Joseph Juran always stressed the role of management and insisted that quality is not about satisfying 'standards', but exceeding them to satisfy customers. Like Deming and others, he opposed the bureaucratization through total quality management (TQM), the International Organization for Standardization (ISO), and other 'killers' of quality. Juran is known mostly for his *Quality Control Handbook*. His research has shown that over 80 per cent of quality defects are controllable by management. Management is the one that must change, not employees. His solution to persistent quality problems is via managerial *breakthrough*:

² Myron Tribus, *Quality First*, Washington, DC: National Society of Professional Engineers (#1459), 1992.

1. Convince others that a managerial breakthrough is needed.
2. Identify the vital key elements using breakthrough methods.
3. Organize for a breakthrough in knowledge.
4. Conduct an analysis to learn causes of problems.
5. Determine the effect of all proposed changes on all parts of the system and ways to overcome resistance to change.
6. Take action to start change; train all involved.
7. Institute appropriate controls that would maintain quality without limiting it.

Juran defines quality management as consisting of quality planning, quality control, and quality improvement. Planning deficiencies can result in chronic waste, and it is up to the control process to limit it. Proper quality planning: results. Quality control consists of measuring actual quality performance and comparing it with standards. Quality improvement is finding ways to do it better than standard and reach higher levels of performance, with the end result being quality levels that are higher than originally planned.

Myron T. Tribus

Tribus's 'eleven points' are more systems oriented and more actionable, but their roots still come from Deming. After learning about the Ba'ta System (see below), Tribus corrected himself on slogans in point 9 and the overreach of point 4. He also changed most of his interpretations towards integrating rather than separating quality from other management issues. His point 6 is brilliant.

1. Workers work in the system while managers work on the system to improve it with their help.
2. Top management must be involved for programme success, not merely in agreement with it.
3. To increase productivity, increase quality of the process.
4. Statistical analysis of systems allows proper identification of real causes and problems.
5. Inspection of process can best be carried out by workers closest to it.
6. The product in the hands of the customer is still a part of the production cycle.
7. The production system should be treated as a whole, not as separate parts. They are all interrelated and interconnected into an integrated system.
8. All managers should prepare goals and objectives for the organization which provide genuine guidance for the day-to-day operations of the system.
9. Get rid of work standards, quotas, and slogans.
10. Quality problems lie with the system, not workers, 85 per cent of the time.
11. Improve quality and lower prices by not forcing vendors to compete for your business.

IPM (Integrate process management)

IPM was evolved at Fordham Graduate School of Business Administration to avoid the dogma of name label and thus open continuous improvement and change in quality concepts. IPM is a new management system compatible with the increasing role of knowledge in society. Not the linear input-to-output mechanistic transformation (which leaves customers 'out there', separated from business), but converting the transformation into a closed action loop which integrates all processes with customers—seeing the customer as the primary source of information, knowledge, and action. Major principles of IPM are:

1. Human knowledge as the most productive form of capital Knowledge must be enhanced and integrated in people themselves.
2. Employees are empowered and responsible for coordination of their actions.
3. Reintegration of task, labour and knowledge via an integrated technology and continuous education.
4. Customers are primary stockholders, the purpose and driving force of enterprise.
5. All employees are autonomous agents and act as customers to each other.
6. The gap between owners and employees must be reduced at the same time as the gap between management and workers. Hierarchical coordination is replaced by self coordination of the system of mutual adaptation.
7. Continuous support and improvement of employee total quality of life is their own responsibility, through their own enterprise.
8. Continuous broadening and expansion of flexibility, adaptability, and responsiveness is the major form of strategic planning. Optimum design and continuous improvement of systems take precedence over effective running of given systems.
9. Continuous knowledge expansion via education, training, job rotation, and creative experimentation of all employees.
10. All management principles are rooted in and derived from treating others via mutual consensus how we ourselves should wish to be treated by others

ROOTS OF THE BAT²A SYSTEM

One of the most remarkable papers on Deming is *Lessons from Tomas Bata for the Modern Day Manager* by Myron T. Tribus.³ Professor Tribus (born 30 October 1921) was a devoted follower and capable interpreter of Deming and his teaching. He is known as

³ Available at <<http://www.bata-konference.utb.cz/2001/czech/referaty/tribus.doc>>. Accessed 25 November 2011.

former director of the Center for Advanced Engineering Study at MIT, where he published Deming's book, *Out of the Crisis*.

After learning important details about the Bat'a Management System, Tribus endeavoured to summarize his reflections in a comparative study of Bat'a and Deming, resulting in his 'Lessons'.

Tribus concluded that the record shows that Tomas Bat'a did indeed precede modern 'quality management' practices by at least half a century. Bat'a was the first to use quality as a way to lower cost at the same time as he created customer delight. It is possible to analyze Bata's work as an example of what W. Edwards Deming has called his 'System of Profound Knowledge', except that Bat'a was a global entrepreneur and his management system was profound knowledge in action.

Tribus prepared a list of 'eleven critical actions' which characterize transforming an enterprise to make 'quality first' a way of life. He called them the 'links' in a chain of transformation.⁴

| Essential Link | Consequences if the Link is Absent |
|------------------------------------|------------------------------------|
| 1. Leadership | Nothing happens, status quo |
| 2. Agreed upon Aim | Crossed purposes become probable |
| 3. Articulated Vision | People are not moved to change |
| 4. Accepted Values | People have no guide to behaviour |
| 5. Visible Strategy | False starts |
| 6. Goals, Long and Short Range | No sense of immediate purpose |
| 7. Appropriate Rewards | Bitterness |
| 8. Adequate Training | Anxiety, fear |
| 9. Internal promotion of quality | Loss of enthusiasm |
| 10. Organization and Communication | No coordination of effort |
| 11. Supportive Constituency | Naysayers take over |

Bat'a fulfilled the requirements in all areas, with the possible exception of statistical methods. He died in 1932. Shewhart's pioneering work, *Economic Control of Quality in Manufactured Product*, was first published in 1931.

Tribus recalls how Dr Deming used to say, scornfully, that you cannot just 'install' quality management. Anyone who studies the Bat'a Management System in depth would discover that you cannot 'install' or 'copy' Bat'a System without first transforming yourself into the kind of man that Bat'a was. He believed in his principles. He stuck with them. He had the courage to persevere, even when times were most difficult. Most of all, he believed that the sole purpose of his company was to enhance the welfare of his community and of society everywhere.

⁴ M. Tribus, 'Eleven Links in the Transformation of An Enterprise To Make Quality the Strategy for Success' (1984). Available on the Internet at <http://deming.ces.clemson.edu/pub/den/deming_tribus.htm>. Accessed 25 November 2011.

In the end, Tribus concludes that, out of all this, some lessons are to be learned by today's entrepreneurs. According to Tribus, the most formidable barrier to using Bata's methods is the belief that the company exists only to enhance shareholder values. Tribus advises:

Therefore, despite the attractiveness of 'going public' and raising money through the sale of shares, I would urge the person who desires to create a great company to build it from within. Figure out how you intend to serve the public. Then figure out how your employees are going to prosper by working with you. Then put your efforts into understanding the customer, on elimination of waste and on production with quality. Do not try to buy your way into the market. Find a way to make profit from your ideas, even if it is not initially the big profit of which you might dream. Use the profit to fund your way forward. When you have a proven business plan, borrow the money; do not sell your company. Do not succumb to the attractiveness of 'going public'. You may be able to make some money that way, perhaps quite a bit. But you will never be able to create a great company.

Another example of Tribus's 'conversion' is related to Deming's point 10. Contrary to Deming, Bata used slogans quite often, and company associates (employees) identified with them and embodied them as their own values. Tribus relates this as follows:

Contrary to advice that I have given when wearing my quality consultant hat, Bata made frequent use of slogans. Here are some:

'Our customer—our master'

'The Customer's order is sacred for us'

'A genuine service to the customer'

The difference between these slogans and the ones I have often seen on the walls of modern enterprises is that Bata actually believed in them and expected the same of all his employees.

Bata established the following principles at the core of his business:

- a) Profit calculations must be completed as soon as possible, that is, weekly.
- b) Every employee can calculate his profit share by himself.
- c) Profit sharing applies to autonomous workshops so that every employee is capable of influencing workshop results.

There are only three companies which continue running similar systems. During World War II, the *Lincoln Electric Company* devised a work system which allowed workers to profit from devising better systems and methods. In Japan, the *Kyocera Corporation* employs the 'Amoeba System' in which individual work units, called amoebas, are engaged in buying and selling to other amoebas through intracompany markets. At *Kyocera* the entire workforce participates in this profit-sharing scheme. Also *Semco*, in Brazil, uses a scheme which is similar to amoebas and the Bata method.

Tribus concludes:

W. Edwards Deming and Joseph Juran deserve the major credit for awakening American managers, having done the same thing for managers in Japan. As we now know, the true pioneer in this subject in Japan was Homer Sarasohn, whose paper

for this conference provides many details of how it happened. Homer's work paved the way for Deming, Juran and others who followed.

Given the seminal role of Homer M. Sarasohn, it is appropriate to introduce a few quotations from his pioneering 1948 book with Charles Protzman, *CCS: Industrial Management*; also the 6 February 1989 article in *Forbes*, pp. 70–78. The influence on Deming's thought is inescapable: Managers should look at every aspect of a manufacturing operation as a piece of an integrated system, and should think through the consequences for the entire system of fiddling with any of its parts.

Every company needs a concise, complete statement of the purpose of the company's existence, one that provides a well-defined target for the idealistic efforts of the employees.

Companies must put quality ahead of profit, pursuing it rigorously with techniques such as statistical quality control.

Every employee deserves the same kind of respect fellow managers receive, and good management is 'democratic management'. Lower-level employees need to be listened to by their bosses.

'We shall build good ships here: at a profit if we can, at a loss if we must, but always good ships' Motto of Newport News Shipbuilding.

Every business enterprise should have as its very basic policy to aim the entire resources and efforts of the company toward a well-defined target, a target that would benefit society.

This present-day fad of aping the Japanese style of management is absolutely destructive of our own future. We've got to recapture the enthusiasm, the pioneering spirit that made America a world leader.

PROCESS QUALITY REVOLUTION: HISTORICAL EMBEDDING

The name of Deming and his quality revolution is forever embedded in the evolution of business models and their requisite management systems. It is therefore fitting to review the evolutionary stages before, and more importantly, after Deming, in order to appreciate the lasting and continued impact of his revolutionary change of phase.

In Figure 11.1 we display the basic scheme of the traditional linear input-process-output system. This system has been fixed and unchanging for centuries. The only change has been in terms of changing the *emphasis and focus* on individual components of the system.

The initial phase BD (Before Deming) was the traditional emphasis on the attributes of the final product:

1. *Final product.* The final product is a primary focus, the production process is considered secondary. Its operations and their sequences are technologically fixed or 'given'. Product quality is 'inspected in', mostly at the end of the process. Statistical quality control, inventory control, cost minimization, mass production, assembly

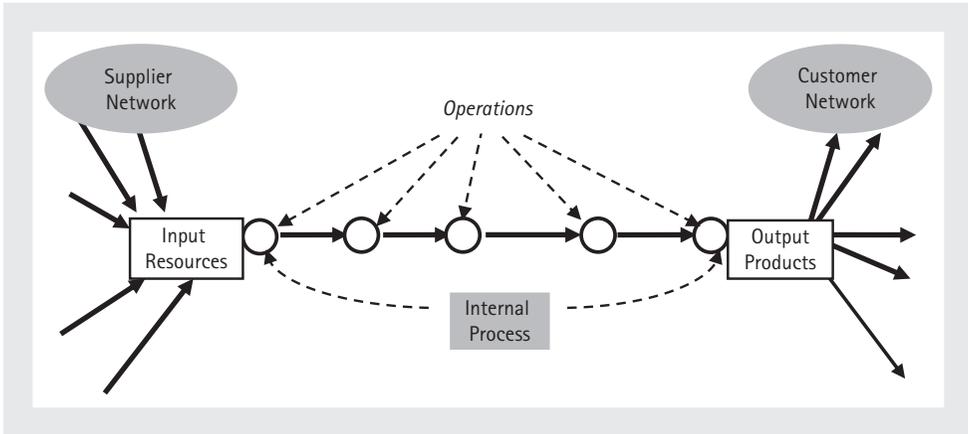


FIGURE 11.1 Basic scheme: product, process, external networks

lines, work specialization, hierarchies of command, mass consumption, statistical mass markets, and forecasting are among the defining characteristics of this stage.

The first AD (After Deming) phase shifted the focus from the product to the process leading to it (taken as given in the previous phase).

2. *Partitioned process.* It is the high-quality process that assures the high-quality product. The main focus was on improving of process *operations*. Quality of the process was understood as the quality of its operations. Powerful new concepts of Total Quality Management, Continuous Improvement (Kaizen) and Just-In-Time (JIT) systems have characterized this stage. Although the operations were being improved, the process architecture and structural sequencing were kept unchanged and remained technologically 'given'.

After the revolutionary 'Deming phase', the focus on the process has become embedded in the next four revolutions:

3. *Integrated process.* The focus of attention shifted from operations (circles) to *linkages* (arrows)—thus changing the process architecture itself. The *re-engineering* of the process, re-integrating individual components into effective, more autonomous, and even self-managed wholes, has characterized this stage. The production process became a business process and therefore subject to qualitative redesign and re-engineering (BPR). Discontinuous improvement and process innovation replaced the piecemeal continuous improvement. Traditional vertical hierarchies of command have flattened out into more horizontal, process-oriented networks. Mass customization, disintermediation, knowledge management, and autonomous teams have started emerging.

In all three of the above stages, the corporate focus was rooted in developing the *internal sources* of competitive advantage, knowledge, innovation, and productivity. Only in the next paradigmatic shifts were the internal processes expanded into the *extended process*—including supplier networks and alliances as well as customer self-service, mass customization, and disintermediation—as the main, increasingly *external sources* of competitive advantage.

4. *Extended process.* In this recently peaked stage, networks of suppliers and communities of customers have extended the internal process into a functional and competitive whole. Both internal and external sources of knowledge and competitiveness have formed new core competencies. Supply and demand chains management have emerged, in dependence on shifting CIP (Customer Intervention Point). Intranets and extranets have provided a communication medium for B2B and B2C exchanges. Quality has become bundled together with cost, speed, and reliability.

Today, powerful processes of global sourcing bring forth and foster a new set of relationships with customers and suppliers. The firm starts disaggregating its production processes, transferring, leasing, or selling selected pieces off to a *higher-added value* operator or provider.

Any firm can be only as good as is the network of which it is a part. Consequently, the firm has disaggregated and became a network. No firm is an island.

5. *Distributed process.* This stage represents the most radical business refocusing so far. Through the global sourcing, sections and components of the internal process are being outsourced to external providers and contractors in search of the highest added value contribution. Long-term alliances are formed and companies are transforming themselves into networks. Network cooperation is replacing corporate competition: 'coopetition' emerges. Globally distributed process ushers in new forms of organization, coordination, and modular integration.

Different parts of the extended process are geographically distributed and often spatially remote. It is useful to note that the incessant and accelerating paradigm shifts are carried out mostly by the leading global players. The majority of companies (and educational and training institutions) could still be in the first, that is, immediately post-war BD phase of the final product; even the early process-orientation shift might have eluded them.

Radically distributed supply and especially demand chains of phase 5 will clearly have to be coordinated and reintegrated on a global scale. Reintegration processes are proceeding under increasing environmental pressures. The search for added value, after exploring traditional global resources, is now turning towards reuse, recycling, recovery, and remanufacturing as new sources of maximizing added value. Innovation in business models will become a norm.

So we observe the *asset-recovery* (Dell, IBM, Xerox) practices expanding quickly to a majority of products and services. New products are being designed for extended life spans and multiple profit cycles. *Reverse logistics* and reverse logistics management (RLM) are adding new loops to the traditionally unidirectional processes of supply chains. Concepts of easy disassembly, durability, reuse, and recycling are being built in.

The new loops are not just traditional information feedback loops, but real business processes of *collection*, *disassembly*, *reprocessing*, and *reassembly* activities (operations). The conventional open-ended linear processes are being redesigned towards closure:

6. *Recycled process.* New loops of recycled products and materials, energy recovery and knowledge renewal are being created within global-sourcing (GS) networks. Product reuse/remanufacture relies on a high residual value which gives a good head start for added value maximization. The system becomes *organizationally closed* and potentially long-term sustainable or even trans-generation self-sustainable. The ‘openness’ and customization of the product design, upgradeable products, flexible product platforms, mutability, and waste-free strategies are being implemented. Of course, new employee skills and managerial knowledge, as well as essential mass customization mindset have to be produced, maintained, and renewed. Eliminating non-value added resources and activities as well as integrating production system elements and work functions are also necessary.

Deming’s concept of Profound knowledge

Who is this that darkeneth counsel by words without knowledge?

Job 38:2

There is clearly a fundamental difference between what people say (or describe) and what people do. Deming was keenly aware of the difference and his warnings about statistical descriptions are well known: ‘Analysis of variance, t-test, and other statistical techniques taught in the books would be not only useless but misleading. Such methods are inefficient: they bury important information in the data.’ All such approaches of aggregation (from averages and indexes to macroeconomic measures) bury information in the data. Aggregates destroy information. That is why management by aggregates is so wasteful and inefficient, especially in macroeconomics. Reduction of variety kills information. One single average hides the myriads of data combinations that could have led to the same outcome. Any scatter diagram is a thousand times more informative than a single number: *Plot the points, don’t just compute the averages*, teaches Deming. What is ‘profound knowledge’ according to Deming? He arrives at the concept as follows:

The prevailing style of management must undergo transformation. A system cannot understand itself. The transformation requires a view from outside. The aim of this chapter is to provide an outside view—a lens—that I call a ‘System of Profound Knowledge.’ It provides a map of theory by which to understand the organizations that we work in.

Profound knowledge thus applies to a system observer, not to its inner components. In order to understand the system (like a company), one has to understand its organization, not just its structure. Organization refers to hidden, invisible, underlying and inter-related *processes* that lead to visible outcomes (like *products*). The distinction between process and product is as profound as the distinction between organization and

structure, or knowledge and information. That distinction is profound knowledge, admittedly only a ‘map of theory’, according to Deming. The realization of the importance of profound knowledge came to Deming in his later years and its theory was not sufficiently elaborated, either by him, or by his followers. This most important part of Deming’s teaching, remains undeveloped, unfinished and misinterpreted. Yet, it is the richest part in terms of its potential. Consider the following:

The first step is transformation of the individual. This transformation is discontinuous. It comes from understanding of the system of profound knowledge. The individual, transformed, will perceive new meaning to his life, to events, to numbers, to interactions between people.

This is an echo of Tomas Bata: Should you ever want to build a big enterprise, build up yourselves first. Only a great person is capable of creating a great enterprise. Each (real) entrepreneur produces three things: him or herself, the enterprise, and the product—in that sequence of importance. First come values, convictions, a vision, character, persistence, knowledge, and capabilities. The next is the enterprise: its ability to produce and provide service, the knowledge of how to do things right, but more importantly how to do the right things. And then, in the end, there is the product and the service that should satisfy the customer better and provide more value than any other does. Note also Deming’s statement that transformation is discontinuous. So called continuous improvement cannot lead to transformation, even though it is transformation, not just improvement, which continues to be sorely needed. Let us continue with Deming’s thought:

Once the individual understands the system of profound knowledge, he will apply its principles in every kind of relationship with other people. He will have a basis for judgment of his own decisions and for transformation of the organizations that he belongs to. The individual, once transformed, will:

- Set an example;
- Be a good listener, but do not compromise;
- Continually teach other people; and
- Help people to pull away from their current practices and beliefs and move into the new philosophy without a feeling of guilt about the past.

So, what do we have to learn in order to grasp and develop the System of Profound Knowledge? Mostly things that are generally not taught at schools of business, management or economics:

1. *Appreciation of a system*: understanding the overall processes involving suppliers, producers, and customers (or recipients) of goods and services;
2. *Knowledge of variation*: the range and causes of variation in quality, and use of statistical sampling in measurements;
3. *Theory of knowledge*: the concepts explaining knowledge and the limits of what can be known;
4. *Knowledge of psychology*: concepts of human nature.

Deming explained:

One need not be eminent in any part nor in all four parts in order to understand it and to apply it. The 14 points for management in industry, education, and government follow naturally as application of this outside knowledge, for transformation from the present style of Western management to one of optimization.

Yet, a system of optimization, understood as balancing multiple (and non-aggregated) criteria, objectives, and purposes, is not a part of Deming's heritage, nor it is a part of (still untransformed) Western management. We still view social systems, companies and economies as *machines* (which they are not), rather than autonomous and adaptive social *organisms* (which they are).

IN DEMING'S OWN WORDS...

My favourite quotations come from Deming's earlier works and especially from his lectures and presentations, still 'in progress', unpolished, and full of contradictions. He liked to repeat them often, even in private discussions, and so many have become 'burnt in', embodied, and thus used and repeated in my own lectures and presentations. Over time, they have become simplified and most importantly: understood. It is remarkable how long it takes for a simple truth to sink in, while a tautological platitude is so readily embraced and propagated by the masses. Here are some of his more memorable quotations:

- *Measures of productivity do not lead to improvement of productivity.* Any measurement is a mere description of action (information), not the action itself (knowledge). Accident statistics tell you that there is a problem, but they do not do anything about the accidents. Figures on productivity in the US do not help to improve productivity in the US.
- *There is no substitute for knowledge.* Deming repeated this statement even in private conversations. Knowledge is the ability to act: a purposeful coordination of action. All knowing is doing, and all doing is knowing. All the rest is just information. Information is not knowledge. Indeed, there is no substitute.
- *Knowledge is theory. We should be thankful if action of management is based on theory. Knowledge has temporal spread. Information is not knowledge. The world is drowning in information but is slow in acquisition of knowledge. There is no substitute for knowledge.* A small correction is needed: knowledge is action based on theory, not the theory itself. But his use of Einstein's insight (information is not knowledge) is certainly a step in the right direction: towards theory of knowledge and knowledge management.
- *Experience by itself teaches nothing.* Experience has to be evaluated and interpreted. Without a proper theoretical framework and context we cannot learn from our

experience. All animals ‘learn’ from their own experience, but humans learn from the experience of others. Sharing (teaching) of knowledge requires theory, a bridge for taking the experience from one context to another.

- *I think that people here expect miracles. American management thinks that they can just copy from Japan—but they don’t know what to copy!* You cannot copy without a theory and understanding. Only surface manifestations are accessible to our senses, not the underlying causes. We can see the structure, but not the organization that produced it. A famous executive went to Toyota to learn about the just-in-time system. He did not invest in understanding the system and so he did not see it at Toyota. He saw some cards and cords and a lot of people with white helmets. Upon his return, all his workers had to wear white helmets. He has ‘copied’ Toyota.
- *Why it that productivity increases as quality is improved?* There are no trade-offs here: as quality goes up, productivity goes up at the same time. And when productivity goes up, profits, wages, and standard of living go up. Increased quality implies less rework, mistakes, and waste. Trade-offs are the sign of badly designed, suboptimal systems. As we improve the processes of the system and get closer to optimal allocation of resources, trade-offs are reduced and ultimately eliminated.
- *Low quality means high cost. Defects are not free.* Current economic practice implies the opposite: one has to pay extra for higher quality because quality is not understood as better process, but as more expensive inputs, materials and labour in the same suboptimal and wasteful process. Quality has not yet been grasped because it does not include cost (and price) as its key dimension. Price has no meaning without a measure of the quality being purchased.
- *Eventually, quality improvement will reach not only production of goods and food (the birthplace of modern statistical theory was agriculture), but the service industry as well.* This has now actually happened in the US. Productivity of services has increased; a smaller percentage of workforce is needed in the service sector. Because humans can only produce food, goods, and services—and nothing else, protracted, transformational unemployment emerges in most developed, mature economies. Only the governmental ‘sector’ can add new jobs, contributing to deficits, waste, and social unrest.
- *Short-term profits are not a reliable indicator of good management.*
- Anybody can pay dividends by deferring maintenance, cutting out research, or by acquiring another company. Paper profits do not make bread. Only speculators and gamblers are comfortable with short-term profits, but they do not create value—like quality and productivity do. Gambling is not investment.
- *The consumer is the most important part of the production line.* Making the wrong product or offering the wrong service, even if everybody in the company does his best and performs with devotion, and employs all the statistical methods, takes the company downhill nevertheless. It is the old difference between efficiency and effectiveness, not to mention explicability and ethics.

- *Materials and components may all be excellent, each by itself, yet not work well together in production or in the finished product. System quality is more important than the quality of each part. Creation of quality is not the same as elimination of non-quality. Toyota works with perfect parts, but their interaction fails because they do not know a system quality concept. Their products mix mechanical with electronic parts even though the two domains are ultimately incompatible. You should not push pedals and levers to work your integrated, solid-state laptop. There is nothing wrong with the glass, nothing wrong with the steel: both meet the specifications. Yet, glass windows do fall from the steel frames to the ground below ...*
- *Barriers against realization of pride in workmanship may in fact be one of the most important obstacles to competitive reduction of cost and improvement of quality in the United States. What can we expect from a culture which refers to company employees as 'headcount'? No wonder that people in management are paralyzed by this problem. They talk about involving the employees (like in politics), forming quality circles, improving communication, and building up motivation. A better way: just get the management involved.*
- *Students learn inefficient methods such as analysis of variance, tests of the null hypothesis, and probability levels of significance. Unfortunately, these mathematical exercises provide no basis for action. These are the words to contemplate, as they come from a pre-eminent statistician.*

NEW WORLD OF QUALITY

Today, notions of quality have shifted from producer/provider defined to customer/consumer defined. Producers have an outdated view of 'conformance to requirements', contradicting Deming's heritage. The customer does not care about 'quality' based on a mere removal of non-quality (defects). Customers care about *value*.

value = Quality/Price (determined by individual customers)

The notion of quality separated from costs (price) is meaningless to the customer. Either we maximize the value, or we extend quality definition to include the price: either way we maximize value for the customer. In the end, we have to measure quality and so need its operational definition. Conformance to requirements, norms, standards, or anything else set by bureaucratic auditors directly contradicts the customer's quest for value. The intermediary of bureaucracy mostly adds to the costs and subtracts from the value.

A good example of good value management is the wine trade and its QPR (Quality-Price Ratio). How does the satisfaction you receive score against the price you have to pay? Do you feel that the benefit you gained was worth the price you paid? Those are the right questions to ask.

In other words, customer designed quality has no correlation with price, and price is a key dimension of quality (value). QPR increases steadily from lowest to highest as follows:

1. Low quality, high cost: customer's 'world of pain.'
2. Low quality, low cost: 'paid little, got little.'
3. Good quality, high cost: difficult trade-off, 'you get what you pay for.'
4. Good quality, low cost: The highest QPR (value), trade-offs-free 'ideal situation.'

Customers want #4, providers would prefer to deliver #1, and often they settle on a compromise of #3, unless... Unless customer satisfaction becomes the driving force and purpose of business, and trade-offs-free alternatives become the new norm. So, when people and organizations focus primarily on quality, defined by Deming's ratio: $Quality = Results\ of\ work\ efforts / Total\ costs$, then quality tends to increase and costs fall over time (trade-offs-free). However, when people and organizations focus primarily on costs, costs tend to rise and quality declines over time (trade-offs-based). The New World of Quality relies on new technology, knowledge, and customer sovereignty to move from a trade-offs-based to a trade-offs-free world. In 1990, Marshall Industries CEO, Robert Rodin, trained with the then 90-year-old Deming and achieved a dramatic transformation and growth from \$400 million to \$1.8 billion. This is chronicled in Deming's very last book *The New Economics*, and Rodin's excellent foresight of trade-offs-free economics in his *Free, Perfect, and Now*. What is the new definition of quality? Quality of the product or service cannot be satisfactory whenever the customer has to consider and accept trade-offs between four key product dimensions: how designed (fitness), how made (process), how delivered (timing) and how priced (price). So, *quality is the process of reducing and removing the trade-offs between fitness, process, timing, and price*. The very existence of trade-offs is incompatible with high value. Trade-offs-based quality is only habitual acceptance in a temporary given context. Trade-offs-free quality is the undisputed preference of all consumers. It was W. Edwards Deming who ushered us into the New World of Quality, especially through his last book. He could not experience it with us and witness its continuing unfolding. But it is on his shoulders that we stand today.

APPENDIX

PERSONAL RECOLLECTIONS

I enjoyed personal acquaintance with Dr Deming on many occasions, including some well-remembered dinners and lunches in Greenwich Village with him and my Fordham colleagues. Even in private, Deming remained challenging and cantankerous, nursing his pre-dinner glass of straight Bombay gin. He could be positively intimidating, even to his friends and admirers. He did not hear very well, so one had to shout challenges at him (it is difficult to shout accolades or approvals). Many a voice broke or choked before finishing ...

Deming directed me towards the philosophy of C. I. Lewis and his early works, on which I designed a knowledge course at Fordham's GBA. In my opinions and research, C. I. Lewis has remained and continues to be a most fruitful source and force.

Deming had some difficulties walking: we had to support him and prop him up when walking the streets of Greenwich Village. Always wearing a non-descript three-piece suit, considerably frayed and rumped, we walked and talked about food, cultures, and government. As all curmudgeons, he loved to tell stories. One of them concerned Dr E. E. Nishibori of JUSE, whom I also had a privilege of meeting during my IPM lectures in Tokyo and Osaka.

Nishibori listened to some 1950s' Bell Labs men talking about how statistical methods had improved the accuracy of American weaponry. 'Yes, I know something about that,' Nishibori said. 'Six fire bombs landed on my house property during the war, and they were all duds.'

Although Deming accepted physical contact and support, he abhorred plain and unprincipled adoration. In fact, many of his most ardent protégés and hangers-on did not seek or enjoy the intensity of personal encounters with him. They preferred to go on with their Master's voice, often missing that Deming himself was so often changing his views, growing and learning all the time, continually improving himself.

Deming's four-day seminars were famous. He would manage to shock, entertain, and instruct hundreds of bewildered subjects by simply stating the obvious: 'Make it right the first time around.' 'There is no substitute for knowledge.' 'How can you know what your business is? There is no way of knowing.' 'Only the employees can know—if you let them.' 'Slogans, goals, targets and yardsticks—get rid of them. Just do it better, always.' 'Your workers are not at fault: they do their best, as you do; it is your system which prevents you from performing.'

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