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Total quality management and the Deming approach to quality management

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Abstract *This article discusses the total quality management (TQM) movement and then elaborates about W. Edwards Deming's experiences and views. Finally, there is a comparison of total quality management and the Deming approach to quality management. The TQM movement was attractive to many organizations during the 1980s and the first half of the 1990s. To succeed, total quality management had many long-term requirements. One of these was that top management must have a passion for the subject. Without this sustained passion top management's attention and energy towards TQM would be diverted to other pressing needs. While Deming insisted that there was no "instant pudding", many consultants in establishing themselves with a client suggested short-term gains. Because of this search for short-term gains, process improvement and reductions in cycle time became very popular and in some cases a final objective. Unfortunately, after they ran their short-term course, many efforts collapsed and TQM was often declared a failure.*

While W. Edwards Deming (1900-1993) is often associated with total quality management (TQM), he did not use nor tolerate use of the term "total quality management". When the term was included in comments from members of his audience or visitors, Deming would be quick to emphasize that he was unaware of the term or that he did not understand the question. Then, he would usually ask the speaker to define TQM. As might be expected, the person who referred to TQM would more than likely stumble through a hastily composed definition. Deming would pick apart the definition and reveal its limitations. There was no doubt that Deming had a low regard for both the term "total quality management" and the application of a quality management practice that differed substantially from his own.

In reviewing the TQM movement two major contributors deserve recognition. The first, Joseph M. Juran, like Deming, spent his life's career in the field of quality management. Particularly popular in the field of health care, Juran is famous for the Juran trilogy, the tripol concept, and his overall approach titled, "Continuous quality improvement". Another major contributor to the TQM movement is Philip B. Crosby. As founder of the Quality College, he

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is famous for conducting extensive training sessions both at his facility in Winter Park, Florida, and on-site for many corporations and other organizations. Known nationally for his work on zero defects, Crosby further developed his quality improvement process when the need and demand for it became evident at the beginning of the 1980s.

Beyond the acronyms and "buzz" words of the past two decades the theories of Deming have not only endured, but they are also as applicable today as they were years ago. In addressing current and future challenges Deming's system of profound knowledge provides a solid theoretical framework that lends itself to practical application. Unlike the failed TQM efforts, Deming's theory and practical approaches remain. Reasons for the life and death of TQM will be debated for many years. This article contributes to this debate by comparing TQM with the Deming approach to quality management.

Total quality management

Following the Second World War, US business and industry dominated many of the world's markets because US industry was at its operational peak, while other major industrial nations were in disarray because of war damage or strains on their productive capacity. Wrongly attributing success in many cases to methods of managing and operating, some US firms attempted to enhance their profits by shifting their attention from productivity and quality to other roles such as marketing, finance and organizational restructuring. Initially, for some firms, this shift in attention was profitable; however, when many European nations and Japan recovered from the Second World War, US business and industry found itself facing a different level of competition. It became apparent in the 1970s that US automotive and electronic industries could no longer take for granted their dominance of world markets. Actually, both the Japanese and the Germans were gaining increasing market share throughout the world and in domestic US markets. "Foreign competition began to threaten US companies in the 1970s. The quality of Japanese products such as cars and TVs began to surpass US-made goods" (Gitlow *et al*., 1995, p. 17).

One attempt to remedy the situation was to increase the number of management seminars used to teach managers and potential managers how to manage more efficiently and effectively. At the time, this seemed to be the correct approach. As a result, management seminars became more popular and the number of management consultants increased. In an attempt to improve their presentations, consultants frequently offered additional approaches or remedies. In time, the number of management consultants increased even further and became a permanent component in the operation of business and industry in the USA. Many of these consultants specialized in specific skills such as marketing, finance and information systems. However, those who specialized in leadership and management were particularly popular because they focused their attention on how the running of the overall organization could be improved. For a while, the application of general systems theory seemed to be the solution to unify all of the functions in an organization.

Unfortunately, in the early 1970s many adherents lost interest in general systems theory because of its unclear academic sounding terms and theoretical complexity. Concurrent with other consulting efforts, applied behavioral science became popular in the 1970s. Further, the subjects of organizational behavior and organizational development were explored by numerous consultants and practitioners who, in many cases, lacked the time or perhaps the patience to fully understand and apply these concepts. It is also interesting to observe that during the late 1970s consultants who focused on leadership and management tended to fall into two camps: one had an emphasis on the human side of enterprise and the other had an emphasis on more traditional approaches. Those in the more traditional camp emphasized, for example, management by objectives (from years earlier) or a wide array of more pragmatic approaches such as "tough minded management".

During the late 1970s and early 1980s the search for solutions on how to manage intensified. At the time, applied behavioral science continued to be popular and was presented in many forms. One, perhaps extreme example, was Werner Erhard's *est*. Popular in the late 1970s, Erhard emphasized that: "You and I possess within ourselves, at every moment of our lives, under all circumstances, the power to transform the quality of our lives." Indeed, many of Erhard's clients believed that his program made a major change in their lives. William Ouchi's book, *Theory Z*, published in 1981, urged Americans not to copy the Japanese. Arguing that you cannot superimpose one nation's culture on another, Ouchi offered another solution. First, he presented what he described as theory A (the American approach in the workplace); then theory J (the Japanese approach in the workplace); and, finally theory Z (those portions of the Japanese approach that could work in the US workplace). In explaining *Theory Z*, Ouchi discussed the need to integrate the needs of the individual with the needs of the organization. In reflecting on the work of Argyris, Ouchi considered:

> Argyris challenged managers to integrate individuals into organizations, not to create alienating, hostile, and impersonally bureaucratic places of work. In a real sense, the Type Z organization comes close to realizing that ideal. It is a consent culture, a community of equals who cooperate with one another to reach common goals. Rather than relying exclusively upon hierarchy and monitoring to direct behavior, it relies also upon commitment and trust (Ouchi, 1981, p. 83).

Even more significant in 1982 was the book *In Search of Excellence*, written by Tom Peters and Robert Waterman. It provided lessons from 42 of the best run companies in the USA. At a time when business and industry were being bombarded by stories about Japanese successes, this book was a welcome relief. Focusing on eight attributes of performance excellence, Peters and Waterman described what these 42 successful US companies had in common. The idea was that readers should learn these eight attributes and apply them to their organizations.

It was during this time and in this setting in the early 1980s that Deming's approach for success in the workplace gained momentum. While he became

famous, in June 1980, because of his message in the NBC News documentary, several years would pass before his approach was applied in a major US corporation:

> Ford, it turned out, was one of the first major US companies to "discover" Deming's expertise in quality management. The association between Detroit's second-largest automaker and America's forgotten quality pioneer would change history for both of them. Less than a decade after their first encounter, Ford would be hailed as a model of American management, and Petersen would lay much of the credit at Deming's feet (Gabor, 1990, pp. 3-4).

Interestingly enough, managers wanted to improve their operations but did not understand Deming's approach or what many consultants were now describing as TQM. Nevertheless, they were in favor of it. Years later, Joji Arai, a pioneer in Japanese quality improvement and a friend of Deming, would observe:

> If you want to sponsor a seminar … and you put "Total Quality Management" as the title, you'll be assured of very enthusiastic participation on the part of American managers. If you ask the sponsors of the program what the definition of total quality management is, essentially what they come up with is nothing more than excellence in management, which American businessmen and academicians have been saying for so many years (Dobyns and Crawford-Mason, 1991, p. 279).

This definition is wrong because there is so much more to TQM. Actually what is needed is an overall transformation. Unfortunately, many managers did not understand this point. Further, while there was a strong demand for TQM during the early 1980s, there were very few individuals who were well-versed on the subject. The major quality management gurus in the USA at the time were: W. Edwards Deming, Joseph M. Juran and Philip B. Crosby. Consequently, hundreds of consultants rushed into this void, and in many cases they attempted to learn about TQM while applying it for a client. While some TQM applications were successful, there were many failures due to misunderstandings and lack of a sustained effort. In some cases the approaches used by these consultants were a mixture of: the behavioral science efforts they used previously, the theories of Deming, and the application methodologies used by Juran and Crosby. Occasionally, popular management approaches, such as empowerment, were added to this eclectic mixture. Unfortunately, the resulting brew lacked cohesion and was often a poison rather than a cure. To understand the evolution of TQM, one also needs to understand the views of two other major contributors. Therefore, the following segment will discuss Juran and Crosby's approaches. Then, the views of Deming will be presented. Finally, the overall TQM approach will be compared with Deming's approach to quality management.

Two other major contributors

While Deming was clearly the paramount figure in the field of quality management, there is general agreement that Juran was also a major figure. Most observers place Juran second only to Deming, and after Juran many other figures follow, such as: Philip B. Crosby, Genichi Taguchi, Kaoru Ishikawa, Armand V. Feigenbaum, Myron Tribus, Joyce Orsini, Gipsie Ranney, Brian

Joiner and Peter Scholtes. Further, no list of major figures would be complete without naming Walter A. Shewhart, Deming's mentor and the person responsible for many of Deming's theoretical underpinnings.

Rather than report the accomplishments of all of these figures and many more, two individuals, Juran and Crosby, will be discussed. Juran was selected because his unique theoretically based approach is very popular in the health care field, and Crosby because his popular approach is similar to many other TQM consulting efforts conducted during the 1980s and first half of the 1990s.

Joseph M. Juran

Juran and Deming are similar in many respects. Juran was born in 1904, Deming in 1900. Deming began his significant and extensive work with the Japanese in 1950, and Juran was invited in 1954 to deliver a series of lectures in Japan. While much was accomplished in Japan before Juran's arrival, both men assisted the Japanese and in time Emperor Hirohito awarded each of them Japan's highest award given to foreigners, the Order of Sacred Treasure.

Born in Romania, Juran immigrated to the USA in 1909 and, like Deming, he had a humble and Spartan upbringing. Finally, in 1920, after many years of hard work and frugal living, Juran enrolled at the University of Minnesota and graduated in 1924 with a BS in electrical engineering. After graduation he was employed by the Inspection Department of Western Electric's Hawthorne Plant located near Chicago. During the Great Depression, when working at a reduced hourly schedule, Juran earned a law degree from Loyola University. In 1937, he moved to the east coast and headed industrial engineering at Western Electric's corporate headquarters in New York. However, at the start of the Second World War, Juran took a leave of absence from Western Electric to serve in a series of positions with the federal government in Washington, DC. Following the Second World War, Juran was chairman of the Department of Administrative Engineering at New York University. While there he also spent considerable time and effort in developing a consulting practice and in researching, writing and publishing about quality management. In 1979, Juran founded the Juran Institute, an organization that teaches, consults and applies many of Juran's ideas and approaches about quality management. After devoting much of his time and energy to the institute, Juran stepped down as its chairman in 1987 and then ceased his public appearances in 1994. The institute is now headed by his colleague and former assistant, A. Blanton Godfrey.

Juran has significantly added to the body of knowledge for quality management. In his post, prior to the Second World War, as head of industrial engineering at Western Electric's corporate headquarters, he was an in-house consultant and often networked with other companies. On one such visit to General Motors, Juran conceptualized the Pareto principle. Today, the frequent application of the Pareto principle in TQM sessions can be attributed to Juran. In 1951, he published the *Quality Control Handbook*, which is now used extensively and is in its fourth edition. Juran is also the author of numerous articles, papers and 14 other books. In his latest book, *A History of Managing*

for Quality, Juran edits and brings together 17 chapters that are written by a diverse group of authors. This collection of writings focuses on the evolution, trends and future directions of managing for quality. In this book, about the history of managing for quality, Juran discusses TQM in terms of its origin and definition:

> By the 1980s it was becoming clear to upper managers that quality leadership could not be achieved by pecking away – by bringing in this or that tool or technique. Instead, it was necessary to apply the entire array of quality know-how (the "quality disciplines") throughout the entire company – to all functions and all levels – and to do so in a coordinated way. One shorthand expression for this comprehensive approach is the term total quality management, or TQM.
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> At the onset there was no agreed standard definition for TQM, so communication became confused. This confusion has since been reduced by the publication of the criteria used by the American National Institute for Standards and Technology (NIST) to judge the applications for the United States' Malcolm Baldrige National Quality Award (Juran, 1995, p. 649).

Juran's notable contributions to the quality management field include: the Juran trilogy, the triprol concept, and company-wide quality management.

The Juran trilogy is used to explain the interrelationship of three processes used to manage quality;

(1) quality planning;

(2) quality control.

(3) quality improvement.

While the first two processes are important, the third process is most significant because improvements in the system substantially reduce chronic waste. Then, lessons learned for improving the system are incorporated as the Juran trilogy is repeated. Conversely, Juran's triprol concept is depicted as a flow diagram. This simple diagram shows the three roles that people have in an organization:

(1) customer;

(2) processor; and

(3) supplier.

The idea is to consider systems rather than individual functions. Studying these interrelationships provides an understanding of the system and subsequently furnishes substantial increases in quality.

Company-wide quality management is also one of Juran's major themes. The idea is that an all inclusive, systematic approach is needed to set and meet quality goals throughout the company. Juran also emphasizes the need to address and measure quality management with the same attention to detail that we use for financial management. Indeed, like Deming, Juran made a substantial contribution to the field.

Philip B. Crosby

Crosby was a popular figure in the TQM movement. His extensive corporate background, superb communications skills and keen ability as an entrepreneur

enabled him to be one of the major figures in the TQM movement during the 1980s. Indeed, Crosby had almost four decades experience as a quality management professional and corporate executive. At Martin Marietta (now Lockheed-Martin) he created the concept of zero defects, and then as a vice-president of the ITT Corporation, he was responsible for ITT's world-wide quality operations. In 1979, when he retired from ITT, Crosby founded Philip Crosby Associates. As the demand for information about quality management intensified, he created the Quality College, which, during the 1980s, became the world's largest TQM consulting firm.

His philosophy about quality can be best described in his four absolutes of quality management. They are:

(1) The definition of quality is conformance to requirements.

(2) The system of quality is prevention.

(3) The performance standard is zero defects.

(4) The measurement of quality is the price of nonconformance.

Finally, the absolutes came together as the four basic concepts of the quality improvement process. There is a fifth: "There is no such thing as a 'quality problem'." But that is for the professional quality people, and very few of them understand that its purpose is to pinpoint problems more tightly than: "The quality department is a mess" (Crosby, 1984, p. 58).

Crosby's presentations were highly professional and convincing. While Deming and Juran often focused their corporate discussions on concepts and theories, Crosby impressed his corporate audience with a variety of graphic aids, well-coordinated, rapid moving discussions, and crisp but precise responses to questions from corporate executives. Crosby's advice was easy to understand. For example: "Why spend all this time finding and fixing and fighting when you could prevent the incident in the first place" (Crosby, 1979, p. 291). Crosby provided the style, format, and pace that chief executives expected in a briefing. As a result, corporate executives were impressed with Crosby and his proposals. Many organizations sent their executives to the Crosby College and frequently they would agree to have Crosby's teams of consultants work on-site in their organization. After he was established on-site with his client's organization, Crosby would follow his 14 steps of quality improvement.

They are:

(1) management commitment;

(2) quality improvement team;

(3) measurement;

(4) cost of quality;

(5) quality awareness;

(6) corrective action;

(7) ZD (zero defects) planning;

(8) employee education;

(9) ZD day;

(10) goal setting;

(11) error-cause removal;

(12) recognition;

(13) quality councils;

(14) do it over again (Crosby, 1984, p. 99).

Crosby enhanced his consulting efforts with a well-trained team of consultants, excellent sets of training literature (often custom-made for the needs of the client) and a complete line of services to help his clients become knowledgeable about his quality improvement approach and how to implement it. Emphasizing continuous improvement, some of Crosby's associates almost became permanent figures in their clients' organizations. In time, however, many of Crosby's clients had a change of heart and their interests were directed elsewhere, or they wanted to try their own approach without any help from Crosby. In some other cases, a change in leadership or organizational structure would bring a new set of executives who had their own agendas. While there were successes, the efforts of Philip Crosby Associates have waned in recent years. A major loss to this energetic firm occurred in 1991 when the charismatic Philip Crosby retired. He is now chairman of Career IV, Inc. where he assists executives in further developing their careers.

Deming's approach to quality management

As was mentioned earlier, Deming became famous in the USA during June 1980 as a result of his appearance in the NBC documentary, "If Japan can, why can't we?" The video described the Japanese industrial recovery following the Second World War and contrasted Japanese successes with the problems of US business and industry. These problems were known in 1980, and the video examined the specific ills that needed to be corrected. Unlike most of the other participants in the film, Deming offered positive solutions about how the US could improve itself. In addition, it became evident to the viewer that Deming was the person to whom the Japanese gave credit for their industrial renaissance during the 1950s. After Deming's years of work with the Japanese, Halberstam had the following appraisal of Deming and his accomplishments in Japan:

> Deming was an American expert on quality control, and by the late fifties he had become something of a god in Japan. With the possible exception of Douglas MacArthur he was the most famous and most revered American in Japan during the postwar years (Halberstam, 1986, p. 311).

Tall and distinguished looking, he appeared to be in reasonably good health for a man of 79. He also gained credibility in this video because of his overall demeanor and a skillful presentation of his views.

> In the 1980 NBC White Paper, "If Japan can, why can't we?" he was called the "founder of the third wave of the Industrial Revolution". Today Deming is generally regarded as the top leader in quality management, and is still cited as the founder of the third wave of the Industrial Revolution (Brocka and Brocka, 1992, p. 64).

Consequently, since 1980, most articles about TQM have included a discussion about Deming's experience and views. Unfortunately, many of these articles confuse Deming's views with the views of TQM.

Deming's experience

W. Edwards Deming was born on October 14, 1900, in Sioux City, Iowa. Raised under frugal conditions, he labored long hours; however, his life was filled with intellectual stimulation and the motivation to thrive in a Spartan environment. In time he substituted W. for William because his father's given name was also William. His middle name, Edwards, was his mother's maiden name. The major highlights of the first 22 years of his life included graduating with a BS in electrical engineering from the University of Wyoming in 1921 and marrying Agnes Bell in 1922. Agnes Deming died in 1930. From 1922 to 1924 he earned an MS in mathematics and mathematical physics from the University of Colorado. At the same time, he was employed as an assistant professor of physics at the Colorado School of Mines. Following graduation, he was an assistant professor of physics at the University of Colorado.

In 1925 Deming moved to the east coast and became an instructor in physics at Yale from 1925-1927. He was then employed as a mathematical physicist at the Department of Agriculture from 1927 to 1939. Concurrent with his work at the Department of Agriculture, Deming earned a PhD in mathematics and mathematical physics at Yale in 1928. In 1932 he married Lola Shupe who would be his wife for 54 years. Then in 1935, he became Head of the Department of Mathematics and Statistics in the Department of Agriculture's Graduate School. In the following year, 1936, he had the opportunity to study with Sir Ronald A. Fisher and Jerzy Neyman at University College in London.

While he was employed, primarily from 1939 to 1945, as the head mathematician and sdvisor in sampling at the Census Bureau, he held other concurrent positions that started during the beginning of the Second World War. They included:

- *1940-1950*. Consultant to Secretary of War and Secretary of Defense.
- *1942-1944*. Taught statistical quality control courses to defense supply industries.
- *1942-1953*. Advisor for Sampling, Bureau of the Budget (Spangler and Sullivan, 1995, pp. 2-3).

Starting in 1946, Deming began a long teaching commitment at New York University. He held this position for most of the remainder of his life.

Deming's long association with the Japanese started in 1947 when he was an advisor for sampling techniques on General MacArthur's staff. Three years later when the Japanese were seeking methods to improve the quality of their

manufactured products, they invited Deming to lecture the Union of Japanese Scientists and Engineers.

> Managing Director Kenichi Koyanagi of the JUSE thought that a lecture course by a famous statistician like Dr Deming could bring about epochal results. For he had been well aware that Dr Deming was one of the American pioneers in statistical quality control, making immense contributions to the education and dissemination of quality control methods (Kilian, 1992, p. 31).

Thus, Koyanagi wrote to Deming on March 8, 1950, and asked that Deming give a course for several days to Japanese research workers, plant managers and engineers. Koyanagi also asked Deming if he would write a message for the inaugural issue of the Japanese journal, *Statistical Quality Control*. Deming was delighted to comply with both of these requests.

During the summer of 1950 Deming presented his courses to 230 engineers in Tokyo. Then he traveled throughout Japan and taught an additional 170 engineers. Deming's audiences were very enthusiastic and eager to learn how to improve the quality of their products. Indeed, at the time, Deming's presentations filled an important need for the Japanese. As word about Deming's courses spread throughout the engineering and management community, his Japanese audience continued to grow. Significant in all this was that his audience included many of the leaders of Japanese commerce and industry. During the first two years, 1950-1951, Deming's audience exceeded 1,100 Japanese engineers and managers. Reflecting on his initial seminars in Japan during 1950, Deming provided the following comment concerning the reservations of the top Japanese managers:

> The first hurdle to overcome with top management in Japan in 1950 was the general supposition that it would be impossible for them to compete with industry in America and Europe in view of the reputation for shoddy quality of consumer goods that Japan had earned. The year 1950 was the beginning of a new Japan in quality (Deming, 1986, pp. 489-90).

From 1950 until his death in 1993 Deming would continue his contacts with the Japanese. Initially, he focused his attention on statistics and then, when the Japanese asked, he gave advice on what to do to improve the actual results revealed by their statistical analysis. As his contacts with the Japanese continued during the 1950s, Deming's views about good management practices began to shape and mature. However, it can be argued that Deming probably learned as much from the Japanese as they learned from him.

From 1946 to 1980 Deming was primarily employed as a consultant in statistical studies. In this role, he would often appear in court as an expert witness when the amount of a substantial award would hinge on the statistical sampling of a damaged product or the amount that should be paid in damages to compensate for a lost opportunity. In many legal arguments about sampling methodology Deming's views would win the case for his client. In addition, Deming also spent considerable time in further refining and writing about the application of statistics. In 1980, after Deming gained fame as the world's leading expert about quality, he focused his attention for the rest of his life

(1980-1993) on transforming the ways of western management. In his last year, at the age of 93, he continued to unselfishly give his time and energy. "Dr Deming is imbued with a missionary zeal in imparting the message in which he and a host of disciples so strongly believe" (Mann, 1985, p. 156). His message had been heard, his latest book revised, and finally US products and services were regaining their reputation for quality.

Emergence of Deming's views

Unlike many of today's management consultants, Deming's views about management emerged from his work as a consultant in statistical studies. When he became famous in the USA as a management expert at the age of 79, he continued to view himself as a statistician, specializing as a consultant in the design and analysis of statistical surveys. In fact, for the rest of his life, his stationery continued to describe him as a consultant in statistical studies. However, "starting in 1980 (from a practical point of view) his name became synonymous with quality" (Walton, 1990, p. 13). He believed that an emphasis on the production of quality products would also yield a reduction in waste materials and the time required to produce these products. From a realistic point of view, Deming also understood the importance of meeting the customer's needs:

> The business process starts with the customer. In fact, if it is not started with the customer, it all too many times abruptly ends with the customer. Dr Deming has said for decades that the customer is the most important part of the production line (Scherkenbach, 1990, p. 9).

While he stressed the importance of quality throughout his career, his work with the Japanese in June, July and August 1950 actually shifted his emphasis from being a statistician to being a management consultant. However, this need to consider corrective action as well as statistics can be traced back to Deming's association with Walter Shewhart in the 1920s:

> Deming's views on statistical quality control and his philosophy of management are a direct result of this early influence by Shewhart. One should remember that Deming was in his fifties when he started working with the Japanese, but he was in his twenties when influenced by Shewhart (Petersen, 1987, p. 133).

During an interview in 1986, Deming discussed his work at the Hawthorne plant and how he learned about Shewhart:

> In 1925 I went to work at the Hawthorne plant of Western Electric near Chicago. They told me about Dr Shewhart who was working at the Bell Laboratories … When I came to Washington after finishing my degree at Yale in June of 1927, I worked for the Department of Agriculture in the Fixed Nitrogen Research Laboratory … The Deputy Chief was Dr Charles R. Kunsman and as it happened, he knew Dr Shewhart very well … They were good friends and Dr Kunsman thought that my acquaintance with Dr Shewhart and his work would be interesting to me and might even help my work; he felt it would broaden my education … So he arranged that I worked with Dr Shewhart from time to time, which was a very great privilege (Petersen, 1986, pp. 7-8).

In March 1938, Shewhart presented four lectures at the Graduate School of the Department of Agriculture. Deming and Shewhart had a close relationship, and

in 1939 Deming edited a book by Shewhart containing these four lectures. It is titled *Statistical Method from the Viewpoint of Quality Control.* In the foreword, as the editor, Deming revealed a significant point in 1939 relative to his later development as a management consultant:

> Most of us have thought of the statistician's work as that of measuring and predicting and planning, but few of us have thought it the statistician's duty to try to bring about changes in the things that he measures (Shewhart and Deming, 1939, p. IV).

Shewhart, who was a major contributor to the development of the field of statistics, also became known as the father of the quality movement. As Deming's mentor in the 1920s and 1930s, he had a major impact on Deming's theoretical underpinnings both as a statistician and as a quality expert. In a discussion of the practical application of statistics, Shewhart offered the following:

> Statistical methods of *research* have been highly developed … Similarly, statistical methods of *control* have been developed by industry for the purpose of attaining economic control of quality of product in mass production. It is reasonable to expect that much is to be gained by correlating so far as possible the development of these two kinds of statistical techniques (Shewhart and Deming, 1939, p. V).

As might be expected, Deming's views about management evolved over a considerable length of time. While his publications prior to the Second World War focused on the use of statistics, there is clear evidence that he was concerned about management's responsibility to improve the system and to correct the errors he was identifying. A major point made by Deming was that variation is the enemy of quality. That is, variation from set standards causes errors in products or services. In his analysis of outcomes he isolated two causes of variation:

(1) Common causes of variation – caused by the system – a responsibility of management to correct.

(2) Special causes of variation – caused by an individual worker.

Deming stressed that too much attention was being paid to correcting mistakes by individual workers, and not enough effort was devoted to improving the system. In discussing this concept he credited Shewhart with an earlier version:

> Shewhart used the term *assignable cause* of variation where I use the term *special cause*. I prefer the adjective *special* for a cause that is specific to some group of workers, or to a particular production worker, or to a specific machine, or to a specific local condition. The word to use is not important; the concept is, and this is one of the great contributions that Dr Shewhart gave to the world (Deming, 1986, p. 310).

Deming emphasized these views during his many training sessions during the Second World War. In 1942, he originated his red bead experiment and used this demonstration, in his many courses at 23 universities, to help the war effort. The red bead experiment requires 800 red beads and 3,200 white beads. Volunteers from the class are asked to use a paddle with 50 depressions to draw 50 beads from a mixture of the red and white beads. Before drawing the beads,

volunteers are instructed to draw only white beads when they dunk their paddle into the mixture. Unfortunately, when the volunteers drew out their paddles red beads were mixed with the white beads. The point to be made is that the system needs to be corrected; that is, red beads should not be included when the mixture is prepared. The essence of the lessons learned from the red bead experiment are summarized below:

- The system (mistakes and all) turned out to be stable.
- All of the variation was provided by the process itself.
- The result or output was not related to worker performance. Indeed, under no circumstances could any of the workers have done better.
- It is wrong to rank workers based on performance that is out of their control.
- Pay for performance in this case was futile.
- The experiment was a display of bad management practices. Procedures were rigid and workers had no chance to offer suggestions to improve output.
- Management should have worked with the supplier to eliminate red beads from the incoming material.

Further development of Deming's views

In considering the evolution and development of Deming's views, it is clear that one of the major pillars of his theoretical underpinnings is that planning requires prediction. In this regard, Deming believed:

> The reason to study the results of a change is to try to learn how to improve tomorrow's product, or next year's crop. Planning requires prediction. The results of a change or test may enhance our degree of belief for prediction, for planning (Deming, 1986, p. 88).

A further understanding of these views can be gained by examining the evolution of what Deming would later call the "Shewhart cycle". Shewhart's 1939 book edited by Deming explained what Shewhart called "the three steps in a dynamic scientific process of acquiring knowledge" (Shewhart and Deming, 1939, p. 45).

- Step 1 … Specification.
- Step 2 … Production.
- Step 3 … Inspection.

This shift, from "old" knowledge to "new" knowledge, was portrayed by Shewhart in 1939 by arranging the above three words in a circle with clockwise arrows. In 1986, in referring to the Shewhart cycle, Deming related: "I called it in Japan in 1950 and onward the Shewhart cycle. It went into immediate use in Japan under the name of the Deming cycle, and so it has been called there ever since" (Deming, 1986, p. 88).

The 1986 version of this model contained the following six steps:

(1) What could be the most important accomplishments of this team? What changes might be desirable? What data are available? Are new observations needed? If yes, plan a change or test. Decide how to use the observations.

(2) Carry out the change or test decided upon, preferably on a small scale.

(3) Observe the effects of the change or test.

(4) Study the results. What did we learn? What can we predict?

(5) Repeat step 1, with knowledge accumulated.

(6) Repeat step 2, and onward.

Titled "the Shewhart cycle", it appeared as a circle with four numbers superimposed in a clockwise fashion and listed steps five and six below the circle.

The 1986 version was developed at a time when Deming was emphasizing that the western style of management must change to halt the decline of western industry. Years later, in 1993, Deming would refine this cycle further in his book, *The New Economics*. This third version was titled, "The Shewhart cycle for learning and improvement … the PDSA cycle" (Deming, 1993, p. 135). Containing four steps, it was intended as a flow diagram for learning and improving a product or a process. In a circle, the functions plan, do, study, act (PDSA) are listed in a clockwise fashion.

In 1993 he provided a further insight about the origin of this cycle. "The PDSA cycle originated in my teaching in Japan in 1950. It appeared in the booklet *Elementary Principles of the Statistical Control of Quality* (JUSE, 1950, out of print)" (Deming, 1993, p. 134).

Another pillar in Deming's overall theoretical framework is his flow diagram to illustrate how improvements in quality improve many other components and byproducts of the system. This chart is one of Deming's favorites, and it appeared in most of his major publications from 1950 to 1993. "This chart was first used in August 1950 at a conference with top management at the Hotel de Yama on Mount Hakone in Japan" (Deming, 1986, p. 4). Titled "Production viewed as a system", it illustrates how an improvement of quality impacts on the entire production line, from incoming material to the redesign of product or service for the future. For service organizations Deming pointed out that various sources could be sources of data or work from proceeding operations. Within the scope of this figure, Deming argued in many of his publications that improvements in quality will result in:

- increases in productivity;
- decreases in cycle time;
- increases in capacity;
- lower production costs;

- improved profits;
- happier customers;
- greater market share;
- more jobs;
- fewer customer complaints;
- less litigation.

Western management's deadly diseases

The Japanese were responsive to Deming's advice, and it was heartening for him to see that his advice was partially responsible for the successes of Japanese business and industry. Concurrent with decades of traveling to and from Japan, Deming taught at New York University and Columbia University while also continuing his consulting efforts in statistical studies. It was during these decades (1950-1980) that Deming noticed the steady decline of western business and industry. Pondering the causes of this decline, Deming formulated what he would later call "management's seven deadly diseases". "To overcome these diseases will require, Deming says, no less than 'a complete shakeup of Western style of management' " (Walton, 1986, p. 89). Earlier versions contained five "deadly diseases" while a final version contained seven "deadly diseases". In 1985 he stated the reason for the decline of western management and listed management's seven deadly diseases:

> For years, price tag and not total cost of use governed the purchase of materials and equipment. Work standards, quotas, exhortations, numerical goals devoid of methods to achieve them, failure to invest in knowledge, failures of training and supervision, have added their contribution to the decline.

Other forces are still more effective:

- Lack of constancy of purpose to plan product and service that will have a market, keep the company in business, and provide jobs.
- Emphasis on short-term profits: short-term thinking (just the opposite from constancy of purpose to stay in business), fed by fear of unfriendly takeover, and by push from bankers and owners for dividends.
- Personal review system, or evaluation of performance, merit rating, annual review, or annual appraisal, by whatever name, for people in management, the effects of which are devastating.
- Mobility of management; job-hopping from one company to another.
- Use of visible figures only for management, with little or no consideration of figures that are unknown or unknowable. Peculiar to industry in the USA.
- Excessive medical costs.

- Excessive costs of warranty, fueled by lawyers that work on contingency fee (Deming, 1985, pp. 6-11).

Deming was not reluctant to blame management. In fact, each of the seven deadly diseases are critical of how management operates. Deming's strong criticisms about management are further illustrated in his comments during an interview in 1988.

> Management has grown up as a hoax. That is, without theory. Without any basic understanding of what the needs of the country are, who is the customer, what is our purpose in life. Each one perpetuates what he believes to be his job. He is not doing wrong. He just doesn't know any better. How could he know? (Petersen, 1988, p. 11).

Transformation of western management

Having stated the causes of the decline of western business and industry, Deming did not have to search very long for a solution. His solution was the process he used years earlier in Japan. As would be expected, many leaders of US business and industry spoke with Deming after he gained fame in the USA in 1980. His main problem was to state his views in a way that would be understood by these American leaders. While most of his theories existed prior to these meetings and discussions, he now had a reason to consolidate his views and clearly articulate them. Consequently, Deming refined his theories and a clearer version was titled, "Principles for transformation of western management". His book, *Out of the Crisis*, published in 1986, contained the clearest rendition to that time of Deming's approach to quality management. A major feature of this book was the explanation of his principles for the transformation of western management. The general idea was that US industry was in nothing less than a crisis, and Deming offered a way out of this crisis. As always, he demanded a total transformation rather than incremental improvements in the way we do business. On some occasions, these principles were referred to as "Deming's 14 points for management". A condensed version is presented below:

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

(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.

(3) Cease dependence on inspection to achieve quality. Eliminate the need for inspection on a mass basis by building quality into the product in the first place.

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

(5) Improve constantly and forever the system of production and service, to improve quality and productivity, and thus constantly decrease costs.

(6) Institute training on the job.

(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.

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

(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.

(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.

(11a) Eliminate work standards (quotas) on the factory floor. Substitute leadership.

(11b) Eliminate management by objective. Eliminate management by numbers, numerical goals. Substitute leadership.

(12a) 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.

(12b) 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 objective.

(13) Institute a vigorous program of education and self-improvement.

(14) Put everybody in the company to work to accomplish the transformation. The transformation is everybody's job (Deming, 1986, pp. 23-24).

Deming insisted that his clients apply all of his philosophy rather than selected portions. In addition, he did not want to be part of quality efforts that included other consultants. Obviously, his view that organizations should have sole source suppliers pertained to consultants as well. Similarly, he had a passion for speaking to groups of managers and students, but would not welcome being part of a panel where his ideas might be diluted or critiqued.

Deming's views matured even further from 1990-1993 when his theories continued to evolve and were expressed in what he called "profound

knowledge". His last book, *The New Economics*, published months before his death in 1993, described "profound knowledge" and its relationship to his 14 points for management.

> The route to transformation is what I call *Profound Knowledge*. The system of profound knowledge is composed of four parts, all related to each other:
>
> Appreciation for a system.
>
> Knowledge about variation.
>
> Theory of knowledge.
>
> Psychology.
>
> My 14 Points for Management (*Out of the Crisis*, MIT/CAES, 1986) follow naturally as application of the system of profound knowledge (Deming, 1994, pp. XV-XVI).

Comparison of TQM and the Deming approach

There is a wide range of opinions on how to conduct TQM. As would be expected, TQM is conducted differently by many consultants and organizations. With this in mind, it should also be recognized that there are some basic similarities that can be found in any successful TQM effort. For example: "For TQM to be successful, it must be adopted throughout the organization and it requires a long-term commitment from the top down" (Price and Chen, 1995, p. 116). Hearing this, advocates of both the TQM approach and the Deming approach would be quick to point out that you need to "walk the talk as well as talk the talk". That is, the right action as well as a stated philosophy is needed.

In examining TQM, it is noticeable that there are major differences between TQM and the Deming approach. This is in spite of the fact that there is a range of differences within the theory and practice of TQM. The major differences between TQM and the Deming approach are:

(1) The Deming approach represents one philosophy that is used in its entirety or not at all. In contrast, "TQM is a general philosophy of management. It can be tailored for a particular environment, and there are as many ways to implement TQM as there are companies adapting it" (Price and Chen, 1995, p. 116).

(2) Both the TQM and Deming approaches agree that a successful effort requires long-term commitment by top management. However, while Deming would not hesitate to drop a client if top management's commitment started to wane, many consultants in the TQM movement would not be so eager to depart an ongoing effort.

(3) The Deming approach insists on a constancy of purpose while TQM adapts itself, in many cases, to the realities of its environment. Consequently, TQM's pragmatic approach often lacks a constancy of purpose.

(4) The Deming approach adopts a new philosophy; that is, one that is intended to transform the western style of management. This philosophy titled "Profound knowledge" has four components:

- Appreciation for a system.
- Knowledge about variation.
- Theory of knowledge.
- Psychology.

The TQM approach lacks this unified and integrated philosophy:

- While the TQM approach tends to emphasize process improvements and reductions in cycle time, the Deming approach emphasizes nothing less than an overall transformation.
- The Deming approach is intended to help top management initiate the transformation and then to depart when this effort is under control by top management. In contrast, many TQM consultants seek long-term consulting efforts with their clients.
- Deep-seated in Deming's approach is his belief in the social responsibility of business. If the purpose of the organization is to make a profit, it is not to earn a huge profit at the expense of the community, but to make a reasonable profit and provide jobs and give stability to the community it serves. In addition, the Deming approach treats "workers throughout the organization with the respect naturally due every human being. There is a moral tone to the Deming approach that is absent in the others" (Hunt, 1992, p. 81).

Many TQM efforts failed because they lacked a well-developed philosophy. In addition, many of these efforts, especially those conducted on an *ad hoc* basis, were doomed to failure because of their temporary nature and a loss of their client's interest as other events and other attractive management approaches diverted the attention of top management.

The views of W. Edwards Deming are worthy of detailed study. His views are complex and not prone to casual reading. Instead, his approach, if it is to be applied, must be studied in detail and applied only in its entirety. A good source of his views is his last book, *The New Economics*. Now in its second edition it is well worth reading.

Closing remarks

During the 1980s and the first part of the 1990s TQM was a popular subject for many people, especially leaders, managers, consultants, business writers, business school professors and students. The subject, represented by the acronym TQM, was contained in countless books, articles, papers, seminars, and consulting efforts. Often promoted as a solution for many of our organizational ills, it failed to materialize when it was applied superficially. Apart from these TQM efforts, Deming had his own approach for improving organizations. He argued that his approach was an economic necessity and spelled out his approach for transforming the ways of western management. Careful not to invent an acronym or even a phrase that could become a "buzz"

word, he sometimes referred to his approach as "my way" or "the transformation into a new style of management".

Many people continue to view TQM as excellence in management, which Americans have been working on for many years. Unfortunately for them, TQM is so much more than this. In addition to being a transformation and a way of thinking, TQM should not be considered as a recipe that can be applied and forgotten. Further, instead of solving problems as they occur, an effective quality effort should improve the system to prevent these problems in the first place. The Deming approach accomplishes this and focuses on top management and the need for top management to change the system. That is, rather than dwell on special causes of variation and search for errors caused by individual workers, Deming emphasizes the removal of common causes of variation by improving the system. Deming's approach emphasizes that top management must implement what he elaborated in his 14 points and his system of profound knowledge.

Beyond the acronyms and failed approaches of the past decade and a half, there is a need to focus on real-world quality issues that continue to challenge management. A first step in this direction would be to study the views of Deming. Then, a more difficult step would be to apply them. Finally, an even greater challenge would be to maintain a constancy of effort to continuously improve our products and services.

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Keenly committed to the human side of enterprise, he was actively involved in the quality movement during the 1980s. In this regard, he interacted with W. Edwards Deming from 1982-1993 and has written and consulted about Deming's approach for improving our Western style of management. With the demise of the generic "buzz words" total quality management, Petersen is attempting to find a solution in Deming's basic principles. Widely published, with more than 80 articles and papers, he has also written about management history with an emphasis on management American style – the old fashioned way (1900-1920).

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