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"No one has to change. Survival is optional." W. Edwards Deming







# Quality... Or Else - Chapter 1

QUALITY Or Else Chapter One: Building Good Ships

For most of the last 50 years the United States was the agricultural and industrial supplier to the world. At one point after World War II, the U.S. controlled a third of the total world economy and made half of all manufactured goods sold anywhere in the world. Now Americans buy more from other countries than they can sell to them; no one particularly wants the products that used to be the envy of the world. If there is any single person who caused that turnabout, it is General of the Army Douglas MacArthur, Supreme Commander of the Allied Powers in Japan after World War II. He did not do it on purpose; Japan's economic success is the unintended consequence of a logical decision. MacArthur wanted reliable radios, a lot of them, so that occupation forces' orders and propaganda programs could be heard in every town and village in occupied Japan, and when Japanese manufacturers in the 1940's couldn't give the General what he wanted, he sent for Americans to teach them how.

Think of that: One man wanted a radio that worked, and the world economic order changed.

One of the Americans MacArthur sent for was 29-year old Homer M. Sarasohn, a systems and electronics engineer with experience in physics, radio, and radar. He agreed to go to Japan for nine months to survey communications problems. He stayed more than five years and learned to speak Japanese so he could teach more effectively. Charles W. Protzman, a 48-year old engineer from Western Electric, joined him in 1948. One year later, those two got a new and more sympathetic boss, Frank Polkinghorn from Bell Laboratories in New Jersey. With his blessing, Protzman and Sarasohn started teaching the Japanese how to manage modern manufacturing firms. It was not a general, theoretical course; it was, according to Kenneth Hopper, who studied what happened, "a concentration of how to manage technology, and in particular, how to manage a factory." Sarasohn and Protzman quoted on the first page of their instruction manual an American industrialist named Collis P. Huntington. He had been one of the tycoons who built the transcontinental railroad, and at an age when most men retire, Huntington built the Newport News Shipbuilding and Drydock Company along the James River in Virginia. He wrote the company motto that Sarasohn and Protzman quoted to help the Japanese understand what quality meant:

"We shall build good ships here; at a profit if we can, at a loss if we must, but always good ships."

When the war ended, it's doubtful the Japanese could have built ships at all, good or bad. American bombing raids had reduced Japan to rubble. No port city was less than 70 percent destroyed, no industrial city less than 40 percent destroyed, and many were much worse than that. Tokyo had been all but burned to the ground by an American incendiary air raid in March, 1945, and in August atomic bombs were dropped on Hiroshima and Nagasaki.

The late Paul Connolly, a Washington attorney, was the first American into Hiroshima after the bombing. A young Naval officer on the destroyer John Pierce, Connolly led a landing party into the city to assess damage. In an interview with the authors in 1976 he said, "We weren't prepared for the devastation that we saw en route. The countryside was almost deserted. I don't know what the weather was, but I have an abiding impressing everything seemed gray .... We were appalled at the final scene. We saw a desert stretching maybe three, four-miles in diameter where there was literally nothing above your shoe tops."

A Japanese businessman writing of that post-war period said Japan's industrial capacity had been reduced to "piles of ashes and skeletons of scrap." It was no better in February, 1946, when Sarasohn arrived: "Factories no longer existed, and people were starving. They had no food. There was no public transportation. The Japanese economy did not exist any longer." MacArthur himself wrote later, "Never in history had a nation and its people been more completely crushed."

Sarasohn's orders from General MacArthur were to build reliable radios so the Japanese could listen to American "information and education programs," to take care of the communications needs of the occupation forces, and to use the communications industry as an example of how the Japanese economy could be revived.

Economic revival of Japan was not a universally popular idea in the late 40's. Senator William P.

Knowland, a conservative from California, demanded a Congressional investigation of MacArthur's economic policies, which conservatives saw as socialistic, or worse. In Washington, Henry Morgenthau, Truman's secretary of the treasury, resigned when his plan to totally dismantle German industry and occupy Japan for 20 generations was rejected. The idea of punishing the former enemy also existed on MacArthur's staff. The Economic and Scientific Section (ESS), which was essentially responsible for all Japanese industry except communications, opposed Sarasohn's and Protzman's plan to teach Japanese managers how to manage efficiently. The ESS was larger than the Civil Communication Section (CCS) Sarasohn worked for, but neither side would back down. It went to MacArthur to decide.

Each side had 20 minutes, no more, to persuade the General. Sarasohn argued for the CCS and remembers the ESS man arguing that "we would create a monster ... that we didn't know what would be the end result of all this, but we should not give them any more to work with to improve their status than we absolutely had to." Did the ESS man see the future Japanese economic competition with the United States? Sarasohn says no. "We did not look down the road that far .... My own faith, my own belief in the American system was that we could meet any competition .... That same confidence in America is what buoyed my argument." Sarasohn's argument was pragmatic: The United States couldn't stay in Japan forever, so the Japanese economy had to be put back on its feet. "I finished, and during all of this time on both arguments, MacArthur sat in back of his desk, smoking his pipe, no reaction whatsoever. I had no idea how well I was getting, if indeed I was getting over to him. Finally, after a minute or so after I had finished and sat down, he got up and started walking out of the office, and I thought, 'Oh, boy, I've blown it.' Just as he about reached the door, he turned around, and he stared at me, and all he said was, 'All right, go do it!' And he walked out."

Sarasohn and Protzman, sitting in separate hotel rooms in Osaka for 30 days, wrote their own textbook, then Polkinghorn added a foreword praising democracy, equality, and cooperation and condemning "greed, selfishness and other antisocial characteristics." A few copies of The CCS Management Seminar manual, 400 typed pages long, still exist. Later Sarasohn wrote a textbook in Japanese titled The Industrial Application of Statistical Quality Control, although when the Union of Japanese Scientists and Engineers (JUSE) first asked for a course in statistical quality control, Sarasohn refused. He said JUSE believed statistical quality control was "the real secret" that had let America win the war. "Now, if they could get hold of statistical quality control, then - and this is a quote - they could regain their 'place in the sun.' I put a squash to that movement." Sarasohn wanted to get factories operating before he taught the Japanese any theory. In fact, what he taught them was a complex theory, but to his engineer's mind it seemed simple, practical, and straightforward: "My conception of all of this is that what exists is a system .... You're not looking at one factory ... you're looking at a system, the input of which is your design, the purpose for which you want this item to exist, and everything that it takes to get to the customer and place that item in his hands to his satisfaction."

The idea that making products or performing services was part of a system had been catching on slowly in the United States since the 1920's and essentially was the second step in the search for quality. The first step had been inspection - the master checking his apprentice's work, the buyer checking the craftsman's product. Inspection works well on an individual basis, but in mass production, inspection is expensive and wasteful. An inspector can only separate good from bad after it's already made, and it costs just as much to make it wrong as it does to make it right. That's why typically, the experts say, 20 to 40 per cent of a manufacturing plant's budget is spent to build, find, and fix mistakes. If, however, mass production is viewed as a system, then you can use statistics to analyze what the system is doing and get it under control. By eliminating waste, you drive costs down; at a very minimum you save the money you don't spend fixing mistakes. That was being taught to some American engineers during World War II, but the idea was not widespread.

Sarasohn is not sure where he heard of it before he taught it to the Japanese. "It just seemed natural to me. It was the way things should go, and from an engineering point of view, it made sense." Myron Tribus, former director of the MIT Center for Advanced Engineering Studies and president of Exergy, Inc., asked Sarasohn later how at his age Sarasohn had known all that. Sarasohn still doesn't know how he knew, he just knew. Other experts agree that he was right - producing anything from a ton of steel to a megawatt of electricity to a bank loan to an insurance policy to a restaurant meal is a system, and unless you look at the whole system simultaneously and find out what it can do, you can't improve it. The CCS management seminar lasted eight hours a day, four days a week, for eight weeks. "And the people who attended were the senior executives, a president, a chief executive .... They were required to attend; they could not send deputies." American occupation forces could require what they liked, and while Sarasohn says he believes in democracy and individual rights, "at that time, in that position, with our charge to revive the Japanese economy, I became a dictator." Those he wanted to attend were simply ordered to be there. Some of Japan's leading industrialists now were Sarasohn's and Protzman's students then - whether they wanted to be or not.

His first question to the students was, "Why is your company in business?" No one had an answer. "And that was the starting point for my argument that there has to be a purpose, there has to be a reason for a company to be in business. A company cannot be merely a money-making machine; it had to have a purpose that went beyond mere profit." Like building good ships.

When Japanese plants first started working again after the war, it was a good day when 10 out of 100 radio vacuum tubes were made well enough to use, a 90 percent failure rate. Quality was not the American team's first concern. The plan was to get factories running with Americans in charge, then find competent Japanese who had not been managers of war industries to take over, and then get them trained at a CCS seminar. The final phase was to wind down American supervision and get the

Japanese managers trained in quality control. Sarasohn wanted quality control to be taught by Walter A. Shewhart, the man who had principally developed the theory of statistical control of quality while working at Western Electric, but Shewhart wasn't available.

Sarasohn remembers that the Economics and Scientific Section then turned to Deming, a friend of Shewhart and a former statistician with the U.S. Census Bureau who had helped the American occupation forces with statistical sampling techniques to get reliable Japanese population figures. MacArthur's headquarters apparently arranged for Deming to be invited to lecture in Japan by Kenichi Koyanagi, managing director of the Union of Japanese Scientists and Engineers, the same group Sarasohn had originally turned down when it asked for statistical quality control training. JUSE members started studying some of Shewhart's material on their own in 1949, but Koyanagi wrote later that he believed "a lecture course by a famous statistician like Dr. Deming could bring about epochal results." Deming agreed to give lectures to the Japanese; he was going to be in Japan anyway working again with the occupation forces.

What Deming would teach was a new quality philosophy that had evolved as he and others developed techniques for the U.S. War Production Board to help improve American war mat*riel. During the war, at Deming's urging and with his help, 35,000 U.S. industrial engineers and technicians were taught to use statistics to find out how to get better results in manufacturing.

From July 10 through 18, 1950, three months before his 50th birthday and one month after the start of the Korean War, Deming taught "Elementary Principles of the Statistical Control of Quality" to 230 Japanese engineers and technicians. In his privately- published travel diary, "Japan 1950," Deming said, "I've never had better students. I'd describe them as the top five percent of all the classes that I ever taught." The lectures tired him; summer in Tokyo can be broiling and consumer air conditioning was waiting in the future. His shirt was sweat-soaked by mid-morning. What made Deming's lectures a success in Japan was not his willingness to work hard under difficult conditions, but his ability to persuade senior Japanese that he was right. On Thursday, July 13, Deming met for dinner at the Industry Club in Tokyo with the presidents and senior officials of Japan's 21 leading industries to talk about quality. He noted in his diary, "I talked to them an hour. There was a lot of wealth represented in that room, and a lot of power. I think they were impressed, because before the evening was over they asked me to meet with them again, and they talked about having a conference in the mountains around Hakone."

Within five years of the end of World War II, which had for any practical purpose destroyed Japan's industrial capacity, managers were being taught quality management techniques, engineers were learning statistical quality control, and the most senior industrialists were being impressed with the importance of quality.

Americans were teaching all of that in Japan, while in the United States, other Americans were busy ignoring it. Tribus remembers that "at about the time Sarasohn and Protzman were lecturing to the Japanese, I was studying some of the same material, though not very seriously. I can report that the common wisdom in the USA was that quality had to be balanced against the cost of attaining it." That common wisdom prevailed, and the idea that higher quality led to lower cost - what Deming would teach the Japanese - was forgotten or ignored in the United States. "The sad thing for me," Sarasohn says, "is that in my cockiness when we went up in front of MacArthur to argue for this CCS management seminar, I had full confidence in the American capability to keep on growing, to keep on going, and as I look back, I see that did not happen."

Sarasohn and Protzman returned to the United States in 1950, Protzman going back to his work at what is now AT&T. He was still fired up by his work in Japan, and he was trying to teach those same principles of quality management to his American colleagues. For his efforts, his son says, he was demoted.

Deming has said, "Export anything to a friendly country, except American management." He says the greatest mistake he ever made was in teaching quality to American engineers and technicians during the war, but not to their bosses. Engineers and technicians make products; they do not make policy, and the decision to produce quality is a policy decision. The people who made policy in American business in 1945 decided quantity was more important. That decision was neither callous, nor venal; as badly as it has turned out, at that time quantity made sense. Other industrial nations were damaged or destroyed. America had to supply much of the world's needs and equally important, buy the goods other nations could produce. Daniel Yankelovich, president of The Public Agenda Foundation, says, "In the post-war period, the United States was the engine of world growth. It wasn't simply that our economy was growing, but we provided a market for the economies of other countries to sell their goods. If it weren't for the U.S. market, there would be no Japanese miracle." At the same time, U.S. industries had to satisfy the domestic demand, which was incredible.

The Great Depression had led into World War II, so in the late 40's and early 50's, people finally had money to buy what they had done without for more than 20 years. During the war, Americans had saved 100 billion dollars to help finance the war effort. After the war, that money financed the pent-up demand for houses and cars and appliances that politicians and industrialists could not ignore. Quantity was the key. John Patrick Diggins in The Proud Decades says 54 percent of American families owned autos in 1948. By 1956, 73 percent did. Make it in mass, get it out the door, and if something's wrong, someone else will fix it. Cars couldn't be made fast enough. Diggins writes, "But really to fulfill the American dream one needed a Cadillac, or so advertisers informed the arriviste of new wealth with such effectiveness that one had to wait a year for delivery." A year! The concern for quality that had

grown during the war all but disappeared as American and world consumers demanded more, and more is what America had learned to make better than anyone in the 20th century.

It was the American economy as much as the allied fighting forces that won World War II. Both Japan and Germany made superior weapons, but not enough of them. When President Franklin Roosevelt announced during the war how many bombers were rolling off American assembly lines, neither allies nor the enemy believed him. Accepted wisdom was that no nation could produce that much, and, in fact, no other nation could.

To understand how different quality management is, you have to understand quantity management and mass production. To mass produce anything you need the parts, a way to put them together, and an efficient way to organize the work. Americans had discovered how to do all three.

The first machine-made, interchangeable parts were introduced at an industrial exhibition at the Crystal Palace in London in 1851. An American gunsmith took 10 working rifles, disassembled them, put the parts in a box, mixed them up, then reassembled 10 working rifles. It would be so ordinary now as to border on ho-hum, but then it was almost shocking, an achievement so stunning that Europeans referred to machine-made, interchangeable parts as "the American system of manufactures."

Once you have parts that are alike, or enough alike that it doesn't matter, you need an efficient way to put them together. Henry Ford could sell every Model T he could make, and it occurred to Ford that he could build a lot more cars if he could keep the workers in one place and move the parts past them to assemble cars. His engineers built the first modern assembly line in 1914.

Once you've got interchangeable parts and a fast way to put them together, you have to organize the people who'll do the work.

Frederick Winslow Taylor published a book in 1911 titled Principles of Scientific Management. (Deming says Taylor hated the title, but his publisher insisted on it.) It became a classic, and more than 35 years after its publication, Sarasohn was still teaching parts of it in Japan, but with substantial modification. "Taylor," Sarasohn says, "neglected the personal quotient much too much. He was more mechanistic." Taylor suggested a precise, scientific method of organizing a factory to get the most out of it, but it dealt also with organization of the work force, reducing each job to its smallest parts and assigning each worker to one repetitive task. In a way, that was forced by America's immigrant work force, where on the assembly line, men standing side-by-side often spoke different languages. As necessary as Taylor's method may have been, it meant that craftsmanship gave way to efficiency.

Interchangeable parts, the assembly line, and scientific management were the basis of modern industrial production, but they were also the basis for Charlie Chaplin's classic film Modern Times and for Aldous Huxley's novel Brave New World. Both condemned the dehumanizing effects of modern technology. The book was set in the year 632 AF, meaning After Ford.

If Chaplin and Huxley saw social costs, others saw economic benefits. In 1908, before the assembly line or Taylor, a Model T Ford cost $850. In 1925, after the assembly line and Taylor, the least expensive Tin Lizzie cost only $290. In constant 1990 U.S. dollars the difference is even more dramatic - nearly $12,000 for a Model T in 1908, less than $2,100 in 1925. In 1916 there were 3.4 million cars registered in the United States, but there were 23 million by 1930. Whatever else mass production may have done, it turned out modern goods for less money, vastly increased the standard of living in the United States and the industrial world, and completely changed how the world made its money. That first major change in the modern world - the ability to mass produce - happened in only 64 years.

The United States stayed with that system through World War II, then when the Japanese were learning how to use quality systems to build better goods for less money, the U.S. was distracted. There were other, more urgent problems - the civil rights movement, the Vietnam War, the war on poverty, the sexual revolution, women's liberation, and concern for the environment. It's worth remembering that while the American economy was worsening, the country's social system was changing and environment improving. The country's rivers and air, to name only two, are markedly cleaner than they were 20 years ago. In the United States, hard at work on other issues, the new economic order remains a stunning surprise.

The Japanese had learned how to produce quality from Sarasohn, Protzman, Polkinghorn, Deming, Juran, Fiegenbaum and others. Kaoru Ishikawa and Genichi Taguchi would add their own quality wrinkles in Japan over the years, just as Philip Crosby would in the U.S. starting in 1979. What is interesting years later is that no two of those men - indeed, no two people we've talked to anywhere - agree precisely on how quality is defined.