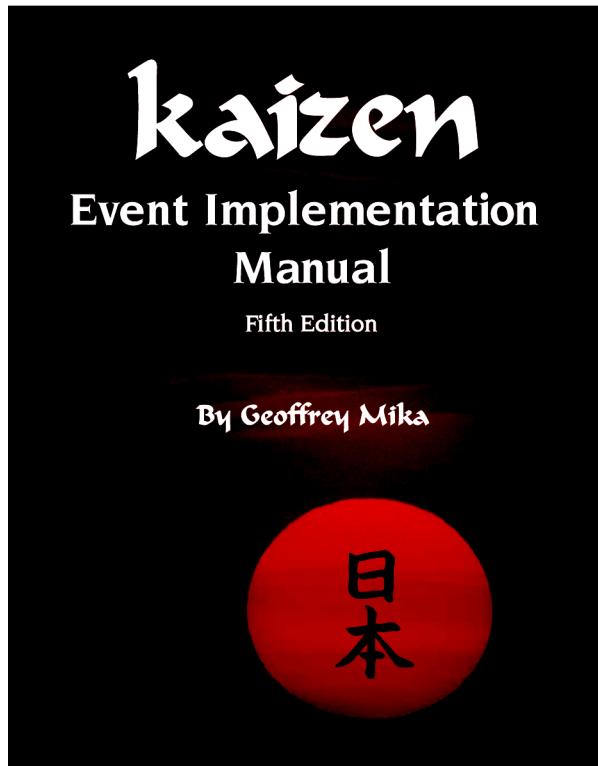


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Society of  
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# Kaizen

# Event Implementation

# Manual

Geoffrey Mika



Society of Manufacturing Engineers  
Dearborn, Michigan

# One

## The History of Lean



### FOUNDING THE TOYOTA PRODUCTION SYSTEM

In 1922, Sakiichi Toyoda, an engineer, humbly started out in the textile business. A few years later he developed the first automatic loom, which allowed for tremendous and continued growth in the Toyoda textile business until the beginning of WWII.

Meanwhile, in Detroit, Michigan, Henry Ford had devised the first moving assembly lines. Ford was continuously working to reduce the manufacturing time required to build a car. As a result of improvements, the time was reduced from 728 minutes to 93 minutes per car by 1927. The retail price of a car went from \$950 in 1908 to \$290 in 1927!

Kiichiro Toyoda visited the Ford Rouge Plant in 1929 to view the successful operation first-hand. There he observed a completely self-contained manufacturing operation.

In 1930, Toyota was asked to produce special vehicles for the Japanese government. To forward this venture into automotive manufacture, Taiichi Ohno was hired in 1932 as a product engineer.

In 1937, Kiichiro Toyoda was faced with a big decision—whether or not to seriously continue in the automotive manufacturing business. He remembered his visit to the Ford Motor Company. That visit was to influence his decision to continue automotive manufacture at Toyota. Kiichiro Toyoda re-

layed his observations from the Ford Motor Company visit to Taiichi Ohno. However, both realized that the investment required to emulate Ford's Rouge facility was beyond the meager means of the new Toyota Motor Company. Mr. Ohno's challenge was to imitate Ford, but with far, far less. Better ways that did not require vast cash resources would have to be found.

At the outbreak of WWII, the company's production shifted from textile equipment to heavy vehicles for the war effort. After the war, Toyota Motor Company floundered. Because of the collapsed Japanese economy, sales were almost zero, and the company was on the brink of bankruptcy.

Soichiro Honda founded the Honda Motor Company in 1948. He was searching for the right combination of theories and processes to grow his company. He too studied all the available information on manufacturing. It is not known for sure, but speculation has it that there were discussions among Honda, Matsushita, and Toyoda regarding the best way to mass produce. They discovered that there were some very promising ideas abounding.

In 1949, Toyota laid off 25% of its workers just to survive. This caused a worker strike, which was only settled when Kiichiro Toyoda resigned, predicating that his mismanagement was responsible for the company's problems. The strike was settled when Toyota agreed that from then on, no worker would ever lose his job. A worker had a job for life, and workers agreed to help the company in return by doing what they could to continuously improve operations.

It was now 1950, and Taiichi Ohno was manager of the Honsha machining plant. His views were developing as he studied the key innovators of the past and present. And within Toyota, Shigeo Shingo was working as an engineering consultant to reduce setup times for stamping dies. He was also working to reduce non-value-added labor. He presented his work, "Production as a Network of Processes and Identification of Lot Delays," to the Japan Management Association.

In 1950, Toyota sold fewer than 3,000 vehicles, which was hardly indicative of what was to come for eventually the world's largest auto-

mobile manufacturer. The company was at a crossroads. How could it survive as an automobile manufacturer and be competitive in the world market?

Toyota was not alone in its strive for world competitiveness. All Japanese manufacturers were facing the same problem. Matsushita Electric Company was trying to emulate Ford's concept of mass production. The company reached out to the mass market by lowering prices to drive up sales. Konosuke Matsushita had developed his own theories about management. He too believed in lifelong employment, and that employees should be continually improving all aspects of the business as part of their responsibility to the company. These progressive ideas were implemented at Matsushita. The challenge then was how to make them work. And would they be successful?

Other pioneers were also making their mark on the industrial world by introducing innovative ideas and theories to address manufacturing problems and challenges. These innovators greatly influenced Taiichi Ohno's thinking, as did the results of WWII. He was contemplating

what would serve Toyota best. Again, he considered what he had seen at the Ford Rouge plant. Could Toyota copy Ford's production system? Probably not. The Ford system required much more capital than Toyota could afford. So he sought other options.

Taiichi Ohno looked at all the available literature and found a 1912 translation of Frederick W. Taylor's, *Shop Management* (Taylor 1911). After more investigating he found more material by Taylor, all of which contained exactly what he was looking for—ways to become more efficient. He found that in 1915 Taylor's theories had been tried at Niigata Engineering's Kamath, Japan plant. Taiichi studied other Japanese translations of American works, including Toshiro Ikeda's "Secret of Eliminating Unprofitable Efforts" from 1925, which was another of Frederick Taylor's works (Ikeda 1925). He also looked at Lillian and Frank Gilbreth's studies on "efficiency." There were many ideas to choose from. This exhaustive and continuing investigation provided him with some basic tools for developing his own "Toyota Production System." But where would he begin?

Japanese businesses struggled to become competitive, seeking more information on how to eliminate non-value added activities and become more efficient. Many American publications were translated and read by the major Japanese business owners. The concept of methods, time, measurements (MTM) was introduced in 1948 (Maynard et al. 1948). Larry D. Miles introduced value analysis at General Electric (Miles 1961). And, Marvin E. Mundel and Ralph Barnes were publishing motion and time study books (Mundel 1985; Barnes 1949).

As manager of machining at the Honsha plant, we know Taiichi Ohno experimented with many ideas, not only those of others, but his own, determining what worked and what did not. What worked became known as the Toyota Production System (TPS).

Taiichi Ohno said, “TPS has a strong feature of emphasizing practical effects and actual practice and implementation over theoretical analysis.” He believed success was determined on the shop floor, through trial and error, as opposed to acceptance based on theory alone.

## INFLUENCE OF AMERICAN QUALITY EXPERTS

The basic rules and concepts of the Toyota Production System were just coming together when a new twist was added. Along came Dr. W. Edwards Deming, Dr. W. A. Shewhart, and Joseph Juran. In 1950, as part of the post-WWII effort to rebuild Japan, Dr. Deming traveled there to advise and train Japanese manufacturers on quality. (Dr. Shewhart was too busy.)

Most of Japan’s early imports to America were cheap, poorly made, and lacked quality. Dr. Deming spent considerable time in Japan teaching companies about statistics and quality, advising them on how to apply the concepts to make good products. He has been called the creator of the “Japanese Industrial Miracle.”

In the same time frame, Joseph Juran conceptualized the Pareto principle and published his *Quality Control Handbook* (Juran 1951). He also lectured throughout Japan, teaching “quality” to business and industry.

Juran and Deming remain highly regarded by Japanese business and industry. In 1951, the highest qual-

ity award in Japan was named after Dr. Deming and is called the Deming Prize.

As a result of the work of Dr. Deming and Joseph Juran, Japan established “inductive statistical quality control” as a standard for quality. At first, Juran and Deming only instructed company management on this standard. It was not until 1961 that this same training was administered to shop-floor personnel.

## WORLD MARKET COMPETITION

Meanwhile Taiichi Ohno was further perfecting the Toyota Production System, adding the improvement of Shigeo Shingo’s single-minute exchange of die (SMED) technique and later his “pre-automation” concept. Other Japanese manufacturers were also developing their own “lean” methods of manufacturing based on what was taught by Deming and Juran, combined with the initial ideas of Gilbreth and Taylor, all of which were widely known.

The decade of the 1950s was a time of transition for manufactur-

ing. The world economy was good, markets were growing, and new products were being introduced. Competition was fierce.

In 1955, 95% of cars sold in the USA were made in the USA. To penetrate the US market, Toyota was preparing to embark on a 20-year plan to convert all of its manufacturing to the Toyota Production System. Part of this transformation would be carried out by Shigeo Shingo through his lectures on “Separation of Workers and Machines.”

By this time, Taiichi Ohno was Vice President of Toyota Motors. He dedicated his life to implementing and perfecting the system he put together from the best ideas the world of business and industry had to offer.

Shigeo Shingo continued his study of industrial engineering and published a study on the scientific thinking mechanism (STM), which was soon followed by additional works.

The year 1960 brought about a milestone event, which energized Toyota to become even more aggressive in its approach to “lean” manufacturing. Nissan won the coveted

Deming Prize for Quality. At this news, Toyota vowed that it too would win the Deming prize. However, it took Toyota until 1965 to earn it.

## KAIZEN

In the early 1960s, Shigeo Shingo introduced the concept of zero quality control (ZQC) (source inspection and the poka-yoke system). From his ideas, in 1962, Tetsuichi Asaka and Kaoru Ishikawa developed “quality circles.” These resulted in the first real kaizen events. Quality circles focused on solving quality problems that interrupted production throughout the plant. The quality circle was a cross-functional team charged with analyzing and finding the root cause of a problem, formulating a solution, and then implementing it. (Much of the problem solving was done with a cause-and-effect diagram with the addition of cards [CEDAC], which was devised by Kaoru Ishikawa in 1950.) It was with the implementation of quality circles that Toyota won the Deming Prize for Quality in 1965.

In 1962, Masaaki Imai established the Kaizen Institute, which was devoted solely to the promotion of kaizen throughout the world. In the USA, domestic automobile

manufacturers were no longer commanding 95% of the domestic market. This statistic was to only get worse.

The 1960s spawned significant new advances in the field of management in the USA. Maynard published the *Industrial Engineering Handbook*, which was one of the first works to recognize that the Japanese had indeed developed systems that were different and better than what was currently used in most American factories (Maynard 1963).

Various other books delved into the inner motivation of workers (Nadler 1963; Maslow 1970; Herzberg 1966; Roethlisberger 1968). Many American companies were basing their management styles on these new theories.

Meanwhile Toyota and other Japanese companies were getting stronger and more competitive by perfecting the Toyota Production System, which defied all of the current motivational theories. Ideas were abounding; application and results were to follow. At Toyota, the TPS was widely accepted and employees were making about one suggestion per person per week. Most suggestions were adopted

immediately through a kaizen event or casually just as a way of improving the workplace. Kaizen was a success.

## THE OIL CRISIS

A major milestone was achieved in 1971. Taiichi Ohno proclaimed that his lifelong ambition to complete the Toyota Production System was achieved. This was just in time for the next major event, the oil embargo, which would establish Toyota and the Japanese as formidable competitors in the world automobile market. The oil crisis forced the Japanese, who import 100% of their oil, to get even leaner so they could continue manufacturing and competing in world markets. Everywhere in companies large and small there was the need to “kaizen” everything to survive, to make do with less, sometimes almost nothing. The real value of kaizen was realized. The culture accepted kaizen. And it worked!

In the USA the oil crisis was weathered, but not without a lot of new rules, laws, and mandates. Speed limits were lowered to 55 mph. There were mandates to the American automobile manufacturers to make fuel-efficient vehicles.

The Japanese had the same challenges, but they had the advantage of the Toyota Production System, the Nissan Production System, the Mazda Production System, the Matsushita System, etc.

The oil crisis meant an overall reduction in sales of larger, less fuel-efficient vehicles; it meant more engineering and, of course, added costs. The race was on between the Japanese and the Americans to develop fuel-efficient cars. But the Japanese cars were already much more fuel efficient, and they were cheaper to buy and operate. Sales of Japanese cars in the USA exploded. Japan was now in the driver's seat.

## EMULATING THE JAPANESE

American manufacturers scrambled to copy from the Japanese. But the know-how was not available in any book. So, in 1979 Ford bought a 25% stake in Mazda to learn firsthand how to become lean. Some US companies formed partnerships with Japanese companies. And others scrambled to learn all they could from wherever they could so they might try to implement their own version of whatever was making the Japanese successful.

In Japan, the assorted manufacturing systems were getting even better. Shigeo Shingo had introduced the nonstock production system (NSP-S) and published his concepts in books (Shingo 1985, 1986, 1988, 1989). Further, Matsushita developed the Mikuni Method, a derivation of the Toyota Production System.

Consultants such as Imai were overwhelmed with opportunities in the USA to train companies on the use of the Toyota Production System through kaizen events. Japanese consulting companies were partnering with American consulting companies. Shingijutsu, founded in 1987 and associated with Productivity, Inc., was the first to offer

Americans a chance to travel to Japan to see first-hand how the Japanese were applying the Toyota Production System and lean manufacturing.

Today there are many tools that originated within TPS. They are: kaizen events, kanban, jidoka, total quality management (TQM), total productive maintenance (TPM), single-minute exchange of dies (SMED), 5S (straighten, sort, shine, standardize, sustain), the visual factory, cause-and-effect diagrams with the addition of cards (CEDAC), hoshin-kanri, andon, poka-yoke, the elimination of muda (waste), and constant teaching and training of the workforce.

## REFERENCES

Barnes, Ralph M. 1949. *Motion and Time Study*, 3rd Edition. New York: J. Wiley.

Herzberg, Frederick. 1966. *Work and the Nature of Man*. Cleveland, OH: World Publishing Company.

Ikeda, Toshiro. 1925. Japanese translation of *Secret of Eliminating Unprofitable Efforts*. *Noritsu Zoshin Mueki No Tesu o Habuku Hiketsu*. Tokyo, Japan: Efishenshi Kyokai, Manejimentosha, Taisho.



- Juran, Joseph M. 1951. *Quality Control Handbook*. New York: McGraw-Hill.
- Maslow, Abraham H. 1970. *Motivation and Personality*, 2nd Edition. New York: Harper & Row.
- Maynard, H. B., Stegemerten, G. J., and Schwab, J. L. 1948. *Methods-Time Measurement*. New York: McGraw-Hill Book Company.
- Maynard, H. B. 1963. *Industrial Engineering Handbook*, 2nd Edition. New York: McGraw-Hill.
- Miles, Lawrence D. 1961. *Techniques of Value Analysis and Engineering*. New York: McGraw-Hill.
- Mundel, Marvin E. 1985. *Motion and Time Study: Improving Productivity*, 6th Edition. Englewood Cliffs, NJ: Prentice-Hall.
- Nadler, Gerald. 1963. *Work Design*. Homewood, IL: R. D. Irwin.
- Roethlisberger, F. J. 1968. "Man in Organization" essays. Cambridge: Belknap Press of Harvard University Press.
- Shingo, Shigeo. 1985. *A Revolution in Manufacturing: The SMED System*. Stamford, CT: Productivity Press.
- Shingo, Shigeo. 1986. *Zero Quality Control: Source Inspection and the Poka-yoke System*. Cambridge, MA: Productivity Press.
- Shingo, Shigeo, 1988. *Nonstock Production: the Shingo System for Continuous Improvement*. Cambridge, MA: Productivity Press.
- Shingo, Shigeo. 1989. *A Study of the Toyota Production System from an Industrial Engineering Viewpoint*. Cambridge, MA: Productivity Press.
- Taylor, Frederick W. 1911. *Shop Management*. New York, London: Harper & Brothers.