

Lean Manufacturing and the Toyota Production System

Ronald M. Becker

The use of the term "Lean", in a business or manufacturing environment, describes a philosophy that incorporates a collection of tools and techniques into the business processes to optimize time, human resources, assets, and productivity, while improving the quality level of products and services to their customers. Becoming "Lean" is a commitment to a process and a tremendous learning experience should you attempt to implement Lean principles and practices into your organization.

The term Lean in the manufacturing environment also refers to the Toyota Production system established by the Toyota Corporation. Within the organization, four prominent gentlemen are credited with developing the system: Sakichi Toyoda, who founded the Toyoda Group in 1902; Kiichiro Toyoda, son of Sakichi Toyoda, who headed the automobile manufacturing operation between 1936 and 1950; Eiji Toyoda, Managing Director between 1950 and 1981 and Chairman between 1981 and 1994; and Taiichi Ohno, the Father of the Kanban System.

Sakichi Toyoda invented a power loom in 1902 and in 1926 an automatic loom capable of detecting a snapped thread that automatically stopped the loom thus preventing production of poor quality. That same year, 1926, he founded the Toyoda Automatic Loom Works that manufactured automatic looms. In 1937, Sakichi sold his automatic loom patents to a company in England to finance an automobile manufacturing operation with his son Kiichiro managing the new venture. At the same time in Yokohama, Japan, the Ford Motor Company was building Model A cars and trucks with mixed models in a plant converted over from the Model T. At this time, Ford was the largest manufacturer of automobiles in Japan with General Motors as the second largest manufacturer, together producing over 90% of the vehicles manufactured in Japan. The new automotive venture for the Toyoda Group was risky.

Kiichiro Toyoda, the son of Sakichi, who possessed a greater interest in engines and automobiles than textiles and loom production, convinced his father to establish an automotive operation in 1936. As managing director of the new operation, Kiichiro traveled to the Ford Motor Company in Detroit for a year of studying the American automotive industry. Kiichiro returned to Japan with a strong knowledge of the Ford production system determined to adapt the system to smaller production quantities. In addition to the smaller production quantities, Kiichiro's system provided for different processes in the assembly sequence of production, the logistics of material simultaneous to production consumption, and a supplier network capable of supplying component material as required. The system was referred to as Just-in-Time within the Toyoda Group.

Eiji Toyoda, a nephew of Sakichi Toyoda, joined the Toyoda Automatic Loom Works family business after graduating from the University of Tokyo in 1936. In 1950, Eiji was named Managing Director of the Toyoda Automotive Works when the Japanese government forced



Kiichiro Toyoda into reorganizing the Toyoda Group. The forced reorganization separated the family businesses and resulted in the resignation of Kiichiro and his entire staff. In the first year as Managing Director, Eiji traveled to the United States to study the American automotive industry and report on American manufacturing methods. After touring the Ford Motor Company operations, Eiji returned to Japan with a desire to redesign the Toyoda Automotive Works plants. An important process learned during the trip was the Ford Motor Company suggestion system. Eiji instituted the concept and it is considered to be one of the major building blocks of the Toyota Production System of continuous improvement (Kaizen).

In 1957, Eiji renamed the Toyoda automotive operation The Toyota Company and again in 1983 to the Toyota Motor Corporation. In 1982, he established the Toyota Motor Sales USA. In 1986, Eiji returned to the United States to renew his study of the American automotive industry. Upon his return to Japan he presented the employees with new challenges. The Toyota Motor Corporation could not just copy the American automotive industry, but needed to produce superior automobiles, and do it with creativity, resourcefulness, wisdom, and hard work.

Taiichi Ohno, considered to be the creator of the Toyota Production System and the Father of the Kanban System, joined the Toyoda Automatic Loom Works after graduating from Nogoya Technical High School in 1932. Early in his career, he expanded upon the JIT concepts developed by Kiichiro Toyoda to reduce waste, and started experimenting with and developing methodologies to produce needed components and subassemblies in a timely manner to support final assembly. During the chaos of World War II, the Loom Works was converted into a Motors Works and Taiichi Ohno made the transition to car and truck parts production. The war resulted in the leveling of all Toyoda Group Works production facilities, but under the management of Eiji Toyoda, the plants were gradually rebuilt and Taiichi Ohno played a major role in establishing the JIT principles and methodologies developed in the Loom manufacturing processes.

At the reconstructed Toyoda Group Automotive Operations, Taiichi Ohno managed the machining operations under severe conditions of material shortages as a result of the war. Gradually he developed improved methods of supporting the assembly operations. The systems that were developed (the Toyota Production System), Ohno credited to two concepts. The first concept from Henry Ford's book *Today and Tomorrow* published in 1926 provided the basis of a manufacturing production system. The second concept was the supermarket operations in the United States observed during a visit in 1956. The supermarket concept provided the basis of a continuous supply of materials as the supermarket provided a continuous supply of merchandise on the store shelves.

Two other gentlemen who helped shape the Toyota Production System were Shigeo Shingo, a quality consultant hired by Toyota, who assisted in the implementation of quality initiatives; and Edward Deming who brought Statistical Process Control to Japan.

The principles and practices of Lean are simplistic and developed over a 90-year period of time. While they have evolved by trial and error over many decades, and many prominent men have contributed to their development, the principles and practices are not easily to implement, which many companies will attest too. Implementation requires a commitment



and support by management, and participation of the all personnel within an organization to be successful.

Management Innovators - The People and Ideas That Have Shaped Modern Business by Daniel A. Wren and Ronald G. Greenwood - Oxford University Press - New York 1998.

Encyclopedia of World Biography - Second Edition c1998 Gale Research 835 Penobscot Bldg. Detroit, MI