History of Toyota Production System (TPS)

Lean Manufacturing

Marek Piatkowski
History of TPS

Toyota did not “Invent” TPS

Toyota developed TPS by benchmarking their management system against best management practices in the World.

What can history teach us …
1890

- Sakichi Toyoda invented the wooden Toyoda handloom

1929 - 33

- Kiichiro Toyoda travels to Europe and the United States to investigate production of automobiles
- Kiichiro Toyoda started research into gasoline-powered engines
- Automobile Department established in Toyoda Automatic Loom Works, Ltd
1929

- Production Toyoda Model AA Sedan, AB phaeton, and GA truck announced

1936 - 37

- Toyota Motor Co. and Toyota's logo established
History of development of TPS

1938

- "Just-in-time" system launched on a full-scale basis.

1940 - 49

- Establishment of several different Toyota Groups: Aichi Steel Works, Toyoda Physical and Chemical Research Institute, Toyota Machine Works Co., Aisin Seiki Co., Toyota Auto Body Co., Nagoya Rubber Co., Nippondenso Co. …
1940 - 45

- The **TWI** (Training Within Industry) Program was established in August 1940 by the National Defense Advisory Commission.

- By Presidential order on April 18, 1942, Training within Industry functions were made part of the War Manpower Commission.

- The Program concluded in April 1945
Toyota accepted teachings of TWI and incorporated them into TPS

**Job Instruction** is used as **Job Instructions**

**Job Methods** became **Standardized Work / Kaizen**

**Job Relations** became **Supervisor Development**
Dr. Taiichi Ohno promoted to machine shop manager.

- Rearrangement of machines from **process flow** to product flow is piloted
- **End of one man one machine**
- Start of multi process handling begins with “L”, “U”, and □ shaped lines in machining.
- Detailed time studies of individual processes and cycle times and motion analysis are conducted
- **Reduction of** work in process **inventory** begins
- In-process inspection by workers is adopted as a policy
- **Line stop** authority to workers is granted as well
History of development of TPS

1947

- Dr. W. Edwards Deming visits Japan to start planning for the Japanese Census. While in Japan, his expertise in quality control techniques, combined with his involvement in Japanese society, led to his receiving an invitation from the society of Japanese Union of Scientists and Engineers (JUSE).

- JUSE members had studied Shewhart's techniques, and as part of Japan's reconstruction efforts, they sought an expert to teach statistical control (SPC).
Dr. W. Edwards Deming

- Dr. Deming's famous 14 Points, originally presented in *Out of the Crisis*, serve as management guidelines. The points cultivate a fertile soil in which a more efficient workplace, higher profits, and increased productivity may grow.

- The ideas of W. Edwards Deming may seem common or obvious now; however, they've become embedded in our culture of work.

- Dr. Deming's ideas (and personal example) of hard work, sincerity, decency, and personal responsibility, forever changed the world of management.

- "It is not enough to just do your best or work hard. You must know what to work on."
“Now more than ever, we need to remember the teachings of Dr. Deming: quality first and follow through with the honest practice of developing quality products and quality people.”

Shoichiro Toyoda, Chairman and former President of Toyota

The Deming Prize has exerted an immeasurable influence directly or indirectly on the development of quality control and quality management in Japan.
The PDCA Cycle was originally conceived by Walter Shewhart in 1930's, and later adopted by W. Edwards Deming.

The model provides a framework for the improvement of a process or system. It can be used to guide the entire improvement project, or to develop specific projects once target improvement areas have been identified.
1950

- After WWII Japan experiencing a crisis in product quality. Japanese goods were thought to be cheap, easily broken and in general extremely poor quality.

- **Financial crisis / Labor dispute** - Voluntary retirements. Shoichiro Toyoda resigns as a President of Toyota. Eiji Toyoda becomes the new President.

- Toyota being on the edge of bankruptcy forces the company to re-visit how they conduct business

- Start of Korean war saves Toyota

- Taiichi Ohno is send to Detroit
1913 – Henry Ford Introduces a concept of an Assembly Line and Mass Production
1951

- Taiichi Ohno studies at Ford principles of mass production and Assembly Line.
- Concept of Takt Time is created.
- Taiichi Ohno learns about **Standardized Work**. Initial Standardized Work Charts are developed.
- **Elimination of waste** concept is created.
1951

- While in USA Taiichi Ohno discovers a Grocery Supermarket
1951

- One of Eiji’s big finds at the Ford Rouge Plant
- Creative Idea **Suggestion System** started at Toyota
1954

- JUSE invites Dr. Joseph Juran to visit Japan to teach them about Quality Management.

- Dr. Juran expanded the **Pareto principle** applying them to quality issues (e.g. 80% of a problem is caused by 20% of the causes). This is also known as the "vital few and the trivial many".

- Dr. Juran initiates "**Quality Circles**" activities in Japan
Dr. Joseph Juran

Quality Management Responsibilities:

- **Strategic - Upper Management** is responsible for establishing and carrying out policy decisions.

- **Operational - Middle Management** is responsible for managing the processes of the company.

- **Workforce** - assuring that specifications are met and work gets done.

- Together, these three levels of a company have the opportunity to assure that quality occurs.
Dr. Joseph Juran

Juran’s 10 steps roadmap for quality planning:

1. Identify Customers
2. Discover Customers' Needs
3. Translate the Customers' Needs into our Language
4. Establish Units of Measure
5. Establish Measurement
6. Develop Product
7. Optimize Product Design
8. Develop the Process
9. Optimize: Prove the Process Capability
10. Transfer to Operations
Dr. Joseph Juran introduced us to classic quality tools:

- Pie charts
- Bar charts
- Run Charts
- Radar Charts
- Scatter Plots
- Histograms
- Pareto Charts
- Brainstorms
- Building Consensus
- Cause and Effect Diagrams
- Relations Diagram
- Pathway
- Affinity Diagrams
- Flowcharts
- Force Field Diagrams
- Tree Diagrams
- Normal Test Plots
- Process Capability Control Charts
1955

- TPS begins to expand slowly outward from the engine, transmission, and chassis shops to other areas.
- Initial **Kanban implementation** and replenishment style production is tested.
- **Production leveling and mixed assembly** is conducted in engine machining and assembly.
- Basic **Andon system** initiated on engine assembly line.
1956 - 57

- Corporate slogan "**Good Thinking, Good Products**" established
- Toyota Motor Sales, U.S.A., Inc. established
- Toyopet dealerships started operations – first export of Japanese car to the USA
- Emergence of more "**Efficient Production System**" (Machining plant with flow, visual control, standardized work, basic pull)
1961

- Start of corporate wide **TQC program** driven by Eiji Toyoda.
- **Pull system** and Kanban complete internally company wide in all of Honsha Plant, and the new Motomachi Plant.
- Average company wide **changeover time** in stamping is down to 15 minutes. Single minute of die exchange machines exist.

1962

- Labor-Management Joint Declaration signed.
1964

- Toyota is awarded The Deming Prize

1969

- Toyota establishes **OMCD** (Operations Management Consulting Division - Seicho-bu). A council of small group of Toyota managers and Ohno protégé’s. Their mandate is to develop Toyota’s Operating principles.
- Initial codification work on TPS begins
1973

- First Oil Crisis - OPEC countries placing an embargo on the West plunges Japan economy into crisis. Only Toyota makes a profit among all the major companies in Japan.
- Discovery of Japanese cars in North America – good on gas “rust buckets”.
- Toyota’s Education Department creates the first 200 page TPS manual in Japanese. This is really the first time that Toyota’s system is called the “Toyota Production System” in writing.
1980-82

- “If Japan can... Why can't we?” was a white paper broadcast by NBC in 1980, credited with beginning the Quality Revolution and introducing the methods of W. Edward Deming to American managers.

- It was strongly believed that Japanese manufacturing techniques were uniquely developed for and suited to the Japanese culture, and thus unsuited for American culture.

- The release of the whitepaper showed that the Japanese techniques were, in fact, taught to Japanese manufacturers by an American (Deming), whose beliefs had been largely ignored by American management.

- “Lights Out” Factories – Total Automation, Robotic Cells
1984

- Toyota signs an agreement with GM. Joint venture operation called NUMMI is established in Fremont California.

1988

- First wholly owned U.S. and Canada facilities start production of cars in Georgetown, Kentucky and Cambridge, Ontario.
1989

- Toyota ventures into a Luxury car market. A Lexus brand is introduced to North America.

1991

- Professors Jones and Womack complete a 5 years study of the transportation industry and the effort documents the benefits of TPS calling it “Lean Production”. The book is entitled “The Machine that Changed the World”.
The End

History of Toyota Production System
Lean Manufacturing Solutions

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Dr. Deming’s 14 Points of Management Guidelines

1. Create and communicate to all employees a statement of the aims and purposes of the company.

2. Adapt to the new philosophy of the day; industries and economics are always changing.

3. Build quality into a product throughout production.

4. End the practice of awarding business on the basis of price tag alone; instead, try a long-term relationship based on established loyalty and trust.

5. Work to constantly improve quality and productivity.

6. Institute on-the-job training.

7. Teach and institute leadership to improve all job functions.
8. Drive out fear; create trust.

9. Strive to reduce intradepartmental conflicts.

10. Eliminate exhortations for the work force; instead, focus on the system and morale.

11. (a) Eliminate work standard quotas for production. Substitute leadership methods for improvement.
(b) Eliminate MBO. Avoid numerical goals. Alternatively, learn the capabilities of processes, and how to improve them.

12. Remove barriers that rob people of pride of workmanship

13. Educate with self-improvement programs.

14. Include everyone in the company to accomplish the transformation.