

Source: [Lean Lexicon](#).

Continuous Flow

Producing and moving one item at a time (or a small and consistent batch of items) through a series of processing steps as continuously as possible, with each step making just what is requested by the next step. It is also called one-piece flow, single-piece flow, and make one, move one.

Cycle Time

How often a part or product is completed by a process, as timed by observation. This time includes operating time plus the time required to prepare, load, and unload. The appropriate calculation of cycle time may depend upon context. For example, if a paint process completes a batch of 22 parts every five minutes, the cycle time for the batch is five minutes. However, the cycle time for an individual part is 13.6 seconds (5 minutes x 60 seconds = 300 seconds, divided by 22 parts = 13.6 seconds).

Jidoka

Providing machines and operators the ability to detect when an abnormal condition has occurred and immediately stop work. This enables operations to build-in quality at each process and to separate men and machines for more efficient work. Jidoka is one of the two pillars of the Toyota Production System along with just-in-time. Jidoka is sometimes called autonomation, meaning automation with human intelligence.

Just-in-Time (JIT) Production

A system of production that makes and delivers just what is needed, just when it is needed, and just in the amount needed. JIT and jidoka are the two pillars of the Toyota Production System.

Kaizen

Continuous improvement of an entire value stream or an individual process to create more value with less waste. There are two levels of kaizen: (1) System or flow kaizen focuses on the overall value stream and (2) process kaizen focuses on individual processes.

Kanban

A signaling device that gives authorization and instructions for the production or withdrawal (conveyance) of items in a pull system. The term is Japanese for sign or signboard.



Lean Production

A business system for organizing and managing product development, operations, suppliers, and customer relations that requires less human effort, less space, less capital, and less time to make products with fewer defects to precise customer desires, compared with the previous system of mass production.

Lean production was pioneered by Toyota after World War II and, as of 1990, typically required half the human effort, half the manufacturing space and capital investment for a given amount of capacity, and a fraction of the development and lead time of mass production systems, while making products in wider variety at lower volumes with many fewer defects. The term was coined by John Krafcik, a research assistant at MIT with the International Motor Vehicle Program in the late 1980s.

Lean Thinking

A 5-step thought process proposed by James Womack and Dan Jones in their 1996 book [*Lean Thinking*](#) to guide managers through a lean transformation. The steps are:

1. Specify value from the standpoint of the end customer.
2. Identify all the steps in the value stream.
3. Make the value creating steps flow toward the customer.
4. Let customers pull value from the next upstream activity.
5. Pursue perfection.

Obeya

Obeya in Japanese means simply “big room.” At Toyota it has become a major project management tool, used especially in product development, to enhance effective and timely communication. Similar in concept to traditional “war rooms,” an Obeya will contain highly visual charts and graphs depicting program timing, milestones and progress to date and countermeasures to existing timing or technical problems. Project leaders will have desks in the Obeya as will others at appropriate points in the program timing. The purpose is to ensure project success and shorten the plan-do-check-act cycle.

Pacemaker Process

Any process along a value stream that sets the pace for the entire stream. (The pacemaker process should not be confused with a bottleneck process which necessarily constrains downstream processes due to a lack of capacity.) The pacemaker process is usually near the customer end of the value stream, often the final assembly cell.



Plan, Do, Check, Act (PDCA)

An improvement cycle based on the scientific method of proposing a change in a process, implementing the change, measuring the results, and taking appropriate action. It is also known as the *Deming Cycle* after W. Edwards Deming who introduced the concept in Japan in the 1950s. The PDCA cycle has four stages:

1. Plan: Determine goals for a process and needed changes to achieve them.
2. Do: Implement the changes.
3. Check: Evaluate the results in terms of performance.
4. Act: Standardize and stabilize the change or begin the cycle again, depending on the results.

Production Lead Time (also *Throughput Time* and *Total Product Cycle Time*)

The time required for a product to move all the way through a process from start to finish. At the plant level this is often termed door-to-door time. The concept can also be applied to the time required for a design to progress from start to finish in product development or for a product to proceed from raw materials all the way to the customer.

Takt Time

The available production time divided by customer demand. For example, if a widget factory operates 480 minutes per day and customers demand 240 widgets per day, takt time is two minutes. Similarly, if customers want two new products per month, takt time is two weeks. The purpose of takt time is to precisely match production with demand. It provides the heartbeat of a lean production system.

Takt time was first used as a production management tool in the German aircraft industry in the 1930s. (Takt is German for a precise interval of time such as a musical meter.) It was the interval at which aircraft were moved ahead to the next production station. The concept was widely utilized within Toyota in the 1950s and was in widespread use throughout the Toyota supply base by the late 1960s.

Toyota typically reviews the takt time for a process every month, with a tweaking review every ten days.

Toyota Production System (TPS)

The production system developed by Toyota Motor Corporation to provide best quality, lowest cost, and shortest lead time through the elimination of waste. TPS is comprised of two pillars, just-in-time production and jidoka. TPS is maintained and improved through iterations of standardized work and kaizen, following the scientific method of the plan-do-check-act cycle.

Development of TPS is credited to Taiichi Ohno, Toyota's chief of production in the post-WWII period. Widespread recognition of TPS as the model production system grew rapidly with the publication in 1990 of [*The Machine That Changed the World*](#), the result of 5 years of research led by the Massachusetts Institute of Technology. The MIT researchers found that TPS was so much more effective and efficient than traditional, mass production that it represented a completely new paradigm.



Value Stream

All of the actions, both value-creating and nonvalue-creating, required to bring a product from concept to launch and from order to delivery. These include actions to process information from the customer and actions to transform the product on its way to the customer.

Value Stream Mapping (VSM)

A simple diagram of every step involved in the material and information flows needed to bring a product from order to delivery. A current-state map follows a product's path from order to delivery to determine the current conditions. A future-state map shows the opportunities for improvement identified in the current-state map to achieve a higher level of performance at some future point.

Waste

Any activity that consumes resources but creates no value for the customer.

