

## Glossary of Lean Terms

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**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. Also called one-piece flow or single-piece flow.

**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, and get ready for the next part or process. The calculation of cycle time may depend upon context. In factory homebuilding the part or process may be a step in the building process such as rough electrical or roofing.

**Five Ss:** One of the guiding principles of lean meant to achieve standardization and stability in the workplace through visual management. The Five Ss are (in order of implementation): Sort (remove anything not needed from the workplace); Set in Order (organize what remains to be easy to find, use and return, to minimize motion waste); Shine (keep everything in top condition so that it is ready to be used); Standardize (establish procedures and systems that promote the ongoing maintenance of Sort, Set in Order and Shine); Sustain (create conditions that help sustain commitment to the Five Ss such as awareness, rewards, support).

**Five Whys:** A method of root cause analysis whereby the investigator repeatedly probes operators and other employees with the simple question “why?” until the root cause of a problem is uncovered.

**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.

**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.)

**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. 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 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 match production with demand. It provides the heartbeat of a lean production system.

**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.

**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 show current conditions. A future-state map shows opportunities for improvement identified in the current-state map to achieve a higher level of performance in the future.

**Waste:** Any activity that consumes resources but creates no value for the customer. There are seven wastes as identified in Lean: Overproduction, Excessive Inventory, Unnecessary Conveyance, Over Processing, Excessive Motion, Waiting, and Corrections.