LEANcyclopedia Lean Glossary

Andon: A line indicator light or board hung above the production line to act as a visual control. Andons are used to visually signal an abnormal condition.

Autonomation: Autonomation with a human touch or transferring human intelligence to a machine. This allows the machine to detect abnormalities or defects and stop the process when they are detected. Also known as *Jidoka*.

Bar chart: A graphical method that depicts how data fall into different categories.

Batch-and-queue: A mass production practice of producing lots and sending the batch to wait in a queue before the next operation.

Benchmarking: An activity to establish internal expectations for excellence, on the basis of direct comparison to "best." In some cases, the best is not a direct competitor in your industry.

Black Belt: A person trained to execute critical projects for breakthrough improvements to enhance the bottom line.

Brainstorming: A technique to generate a large number of ideas in a short period of time.

Breakthrough objectives: In Policy Deployment, those objectives characterized by multifunctional teamwork, significant change in the organization, significant competitive advantage, and major stretch for the organization.

Cell: A logical and efficient grouping of machines or processes that enables one-piece flow.

Cellularization: Grouping machines or processes that are connected by work sequence in a pattern that support flow production.

Cellular manufacturing: Manufacturing with the use of cells. See *cell*.

***Chaku-Chaku*:** Japanese term for "Load-Load." It refers to a production line raised to a level of efficiency that allows the operator to simply load the part and move on to the next operation. No effort is expended on unloading. See *Hanedashi*.

Champion: An individual who acts as the sponsor or owner of a project and has the authority and responsibility to inform, support, and direct a team. Typically the individual is a director or vice-president-level manager. Also known as a mentor or sponsor.

Changeover: Altering a process to manufacturing a different product.

Changeover time: As used in manufacturing, the time from when the last "good" piece comes off of a machine until the first "good" piece of the next product is made on that machine. Includes warmup, first-piece inspection, and adjustments. Changeover times can be reduced through the use of SMED.

Cost of Poor Quality (COPQ): Costs associated with not doing things right the first time. Examples of COPQ include scrap, rework, and waste.

Countermeasures: Immediate actions taken to bring performance that is tracking below expectations into the proper trend. Requires root-cause analysis.

Curtain effect: A method that permits the uninterrupted flow of production regardless of external process location or cycle time. Normally used when product must leave the cell for processing through equipment that cannot be put into the cell (i.e., heat-treat, painting). Curtain quantities are calculated using the following formula: curtain quantity = per unit cycle time of curtain process/takt time.

Customer: Anyone who uses or consumes a product or service. A customer can be internal or external to the provider.

Cycle time: The time from the beginning of one operation in a process until it is complete.

Defect: A nonconformance in a product or service.

Design for manufacture and assembly (DFMA): A philosophy that strives to improve costs and employee safety by simplifying the manufacturing and assembly process through product design.

Deviation: The difference between an observed value and the mean of all observed values.

Downtime: Lost manufacturing time due to equipment, material, information, or manpower.

Economic value added (EVA): A residual income measure that subtracts the cost of capital from the net operating profits after taxes (NOPAT). It is the financial performance measure most closely linked to shareholder value and the cornerstone for a financial management and incentive compensation system that makes managers think and act like owners.

Failure mode and effects analysis (FMEA): A structured approach to assess the magnitude of potential failures and identify the sources of each potential failure. Corrective actions are then identified and implemented to prevent failure occurrence.

5S: A method of creating a self-sustaining culture that perpetuates an organized, clean, and efficient work place. Also referred to as the five pillars of the visual workplace.

Five-Why method: A simple problem-solving method of analyzing a problem or issue by asking "Why?" five times. The root cause should become evident by continuing to ask why a situation exists.

Fixed costs: Costs of production that do not change when the rate of output is altered.

Flexibility: The ability to respond to changes in demand, customer requirements, etc.

Flowchart: A pictorial representation of a process that illustrates the inputs, main steps, branches, and outcomes of a process. A problem-solving tool that illustrates a process. It can show the "as is" process or "should be" process for comparison and should make waste evident.

Flow production: A philosophy that rejects batch, lot, or mass processing as wasteful. Product should move (flow) from operation to operation in the smallest increment, one piece being ideal. Product should be pulled from the preceding operation only as it is needed. Often referred to as "One-Piece Flow," only quality parts are allowed to move to the next operation.

Gage capability study: A method of collecting data to assess the variation in the measurement system and compare it to the total process variation.

Green Belt: An individual trained to assist a Black Belt. This individual may also undertake projects of a lesser scope than Black Belt projects.

Hanedashi: Device or means of automatic unload of the work piece from one operation or process, providing the proper state for the next work piece to be loaded. Automatic unloading and orientation for the next process is essential for a "*Chaku-Chaku*" line.

***Heijunka*:** Production-leveling process. This process attempts to minimize the impact of peaks and valleys in customer demand. It includes level production volume and level production variety.

Hoshin action plan: Form used by the team to detail specific activities required for success, milestones, responsibilities, and due dates.

Hoshin implementation plan: A form used to track performance (plan vs. actual) on Policy Deployment objectives. Usually reviewed with top management on a monthly basis, but reviewed by the Policy Deployment team more frequently.

Hoshin Kanri: A strategic decision-making tool that focuses resources on the critical initiatives to accomplish organizational objectives. This process links major objectives with specific support plans throughout the organization.

Hoshin strategic plan summary: Form used to show relationships between 3- and 5-year objectives, improvement priorities, targets, resources required, and benefits to the organization.

Input: A resource that is consumed, utilized, or added during a process.

***Jidoka*:** Automation with a human touch or transferring human intelligence to a machine. This allows the machine to detect abnormalities or defects and stop the process when they are detected. Also known as Autonomation.

Just-in-Time (JIT): A strategy that concentrates on delivering the right products in the right time at the right place. This strategy exposes waste and makes continuous improvement possible.

***Kaikaku*:** Radical improvement to eliminate waste.

Kaizen: Japanese for "continuous improvement." The term is composed of *kai*, meaning "to take apart" and *zen*, meaning "to make good." Based on the philosophy that what we do today should be better than yesterday and what we do tomorrow should be better than today, never resting or accepting status quo.

Kaizen event: A planned and structured event to improve an aspect of a business.

Kanban: Japanese term meaning "signboard" or "signal." It is a means of communicating a need for products or services. It is generally used to trigger the movement of material where One-Piece Flow cannot be achieved, but is also used to signal upstream processes to produce product for downstream processes.

***Keiretsu*:** A grouping of Japanese companies that allows each to maintain operational independence but also to establish a permanent relationship with other members in the group.

Key Performance Indicator (KPI): A method for tracking or monitoring the progress of existing daily management systems.

Lead time: The total time required to deliver an order to the customer.

Machine cycle time: The time from when the "start" button is pressed until the machine returns to the original starting position.

Manufacturing lead time: The total manufacturing time beginning from raw material to creating the final, saleable product.

Material Requirements Planning (MRP): A computerized system to determine the quantity and timing of material supplies on the basis of a master production schedule, a bill of materials, and current inventories.

Metric: A performance measure that is linked to the goals and objectives of an organization.

Milk run: A supply and/or delivery vehicle that is routed to various locations to pick up or deliver products and supplies. A milk run can be external to customers or suppliers. A milk run can also be internal to a factory with a material handler.

Mission: A statement of an organization's purpose.

Mixed model: A value stream that accommodates multiple product models.

***Muda*:** Japanese for waste.

Multiskilled worker: Associates at any level of the organization who are diverse in skills and training. They provide the organization with flexibility and grow in value over time. Essential for achieving maximum efficiencies for JIT.

***Mura*:** Japanese for unevenness.

***Muri*:** Japanese for unreasonableness.

Noise: Unexplained variability in a response.

Non-value-added (NVA): Those process steps that take time, resources, or space, but do not transform or shape the product or service toward that which is sold to a customer. These are activities that the customer would not be willing to pay for.

Operator cycle time: The time for an operator to complete one cycle of an operation. The total operator cycle time includes walking, loading, unloading, and inspection.

One-Piece Flow: A manufacturing process in which product moves one piece at a time through all necessary operations.

Output: A product or service delivered by a process.

Pareto chart: A vertical bar graph for attribute or categorical data that shows the bars in descending order of significance, ordered from left to right. Helps to focus on the vital few problems rather than the trivial many. An extension of the Pareto Principle suggests that the significant items in a given group normally constitute a relatively small portion of the items in the total group. Conversely, most of the items will be relatively minor in significance (i.e., the 80/20 rule).

Parts per million (PPM): A measure of the number of defective units per million opportunities. A Six Sigma level process is 3.4 defects per million.

Pilot cell: An experimental exercise in a cell to determine the viability of a concept.

Plan-Do-Check-Act (PDCA) cycle: PDCA is a repeatable four-phase implementation strategy for process improvement. PDCA is an important item for control in Policy Deployment. Sometimes referred to as the Deming cycle.

Poka-yoke: A Japanese expression meaning mistake-proof. A method of designing production or administrative processes that will, by their nature, prevent errors. This may involve designing fixtures that will not accept an improperly loaded part.

Policy Deployment: See *Hoshin Kanri*.

Process: An activity that blends inputs to produce a product, provide a service, or perform a task.

Process map: A visual representation of the sequential flow of a process. Used as a tool in problem solving, this technique makes opportunities for improvement apparent.

Production smoothing: See *Heijunka*.

Productivity: Output per unit of input (e.g., output per labor hour).

Pull: A system in which replenishment does not occur until a signal is received from a downstream customer.

Push: Conventional production in which product is pushed through operations on the basis of sales projections or material availability.

Quality characteristic: An aspect of a product that is vital to its ability to perform its intended function.

Queue: Inventory authorized by a push signal.

Return on Investment (ROI): A ratio of profit relative to the money invested. It is a measure of the income provided by an investment.

Rework: An activity to correct defects produced by a process.

Root cause: The ultimate reason for an event or condition.

***Sensei*:** A teacher with a mastery of a body of knowledge.

Setup time: The time between the last good piece to the first good piece of the next product.

***Shusa*:** A strong team leader in the Toyota product development system.

Sigma (σ): Standard deviation of a statistical population.

Sigma capability: A measure of process capability that represents the number of standard deviations between the center of a process and the closest specification limit. See *Sigma level*.

Sigma level: A measure of process capability that represents the number of standard deviations between the center of a process and the closest specification limit. See *Sigma capability*.

Signboard: English for the Japanese term *kanban*. See *kanban*.

Single-Minute Exchange of Dies (SMED): Method of increasing the amount of productive time available for a piece of machinery by minimizing the time needed to change from one product to another. This greatly increases the flexibility of the operation and allows it to respond more quickly to changes in demand. It also has the benefit of allowing an organization to greatly reduce the amount of inventory that it must carry because of the improved response time while maximizing ROI and EVA.

Six Sigma: A quality improvement and business strategy that emphasizes impacting the bottom line by reducing defects, reducing cycle time, and reducing costs. Six Sigma began in the 1980s at Motorola.

Spaghetti chart: A map that illustrates the path of a product as it travels through the value stream.

Standard: A prescribed documented method or process that is sustainable, repeatable, and predictable.

Standard deviation: A measure of variability in a data set. It is the square root of the variance.

Standardization: The system of documenting and updating procedures to make sure everyone knows clearly and simply what is expected of them. Essential for the application of the PDCA cycle.

Standard Work: A tool that defines the interaction of people and their environment when processing a product or service. It details the motion of the operator and the sequence of action. It provides a routine for consistency of an operation and a basis for improvement. Standard Work has three central elements: takt time, Standard Work Sequence, and Standard Work-in Process.

Standard Work-in-Process: The minimum amount of material for a given product that must be in process at any time to insure proper flow of production.

Stretch goal: A goal designed to create out-of-the box thinking for breakthrough improvement.

Supermarket: An inventory storage location authorized by a kanban pull system.

Supplier partnership: An approach to business that involves close cooperation between the supplier and the customer. It provides benefits and responsibilities that each party must recognize and work together to realize.

Takt time: The frequency with which the customer wants a product and how frequently a sold unit must be produced. The number is derived by dividing the available production time in a shift by the customer demand for the shift. Takt time is usually expressed in seconds.

Target cost: The cost a product cannot exceed for the customer to be satisfied with the value of the product and the manufacturer to obtain an acceptable return on investment.

Throughput time: The total time for a product from concept to launch, order to delivery, or raw material to customer delivery.

Total cost: The market value of all resources used to produce a good or service.

Total Productive Maintenance (TPM): Productive maintenance carried out by all employees. It is based on the principle that equipment improvement must involve everyone in the organization, from line operators to top management.

Total revenue: The price of a product multiplied by the quantity sold in a given time period.

Total utility: The amount of satisfaction obtained from the entire consumption of a product.

Toyota Production System (TPS): A manufacturing model built on reducing lot sizes to allow for flexibility, control of production parts, and the logical arrangement of production equipment.

Utility: The pleasure of satisfaction obtained from a good or service.

Value: A capability provided to a customer for an appropriate price.

Value added: Any process or operation that shapes or transforms the product or service into a final form that the customer will purchase.

Value stream: All activities required to design and produce a product from conception to launch, order to delivery, and raw materials to the customer.

Value stream mapping: A process for identifying all activities required to produce a product or product family. This is usually represented pictorially in a value stream map.

Variance: A measure of variability in a data set or population. Variance is equal to the squared value of standard deviation.

Variation: A process is said to exhibit variation or variability if there are changes or differences in the process.

Visual control: Visual regulation of operations, tool placement, etc. that provides a method for understanding a process at a glance.

Visual management: Systems that enable anyone to immediately assess the current status of an operation or given process at a glance, regardless of their knowledge of the process.

Voice of the customer (VOC): Desires and requirements of the customer at all levels, translated into real terms for consideration in the development of new products, services, and daily business conduct.

Waste: Also known as *Muda*. Any process or operation that adds cost or time and does not add value. Eight types of waste have been

identified: (1) overproduction, (2) waiting or idle time, (3) unnecessary transportation, (4) inefficient processes, (5) unnecessary stock on hand, (6) motion and efforts (7) producing defective goods, and (8) unused creativity.

Work-in-process: Material in the process of being converted into saleable goods.

Work sequence: The specific order in which an operator performs the manual steps of the process.