**ACKNOWLEDGMENTS**

This glossary was compiled by Quality Progress editorial staff members over the years. Volunteers James L. Bossert, Grace L. Duffy, R. Dan Reid and James J. Rooney reviewed and edited many of the entries in early 2018.

A

**Academic Quality Improvement Project (AQIP):** A forum for higher education institutions to review one another’s action projects.

**Acceptance number:** The maximum number of defects or defectives allowable in a sampling lot for the lot to be acceptable.

**Acceptance quality limit (AQL):** In a continuing series of lots, a quality level that, for the purpose of sampling inspection, is the limit of a satisfactory process average.

**Acceptance sampling:** Inspection of a sample from a lot to decide whether to accept that lot. There are two types: attributes sampling and variables sampling. In attributes sampling, the presence or absence of a characteristic is noted in each of the units inspected. In variables sampling, the numerical magnitude of a characteristic is measured and recorded for each inspected unit; this involves reference to a continuous scale of some kind.

**Acceptance sampling plan:** A specific plan that indicates the sampling sizes and associated acceptance or nonacceptance criteria to be used. In attributes sampling, for example, there are single, double, multiple, sequential, chain and skip-lot sampling plans. In variables sampling, there are single, double and sequential sampling plans. For detailed descriptions of these plans, see the standard *ANSI/ISO/ASQ A3534-2-1993: Statistics—Vocabulary and Symbols—Statistical Quality Control*.

**Accreditation:** Certification by a recognized body of the facilities, capability, objectivity, competence and integrity of an agency, service or operational group or individual to provide the specific service or operation needed. The term has multiple meanings depending on the sector. Laboratory accreditation assesses the capability of a laboratory to conduct testing, generally using standard test methods. Accreditation for healthcare organizations involves an authoritative body surveying and verifying compliance with recognized criteria, similar to certification in other sectors.

**Accreditation body:** An organization with authority to accredit other organizations to perform services such as quality system certification.

**Accuracy:** The closeness of agreement between an observed value and an accepted reference value.

**ACLASS Accreditation Services:** An ANSI-ASQ National Accreditation Board company that provides accreditation services for: testing and calibration labs in accordance with ISO/IEC 17025; reference material producers in accordance with ISO Guide 34; and inspection bodies in accordance with ISO/IEC 17020.

**Activity-based costing:** An accounting system that assigns costs to a product based on the amount of resources used to design, order or make it.

**Activity network diagram:** An arrow diagram used in planning.

**Advanced Product Quality Planning (APQP):** A high-level automotive process for product realization, from design through production part approval.

**Adverse event:** A healthcare term for any event that is not consistent with the desired, normal or usual operation of the organization; also known as a sentinel event.

**Affinity diagram:** A management tool for organizing information (usually gathered during a brainstorming activity).

**NEW! Agile:** Shorthand for agile project management. This is a type of software project management that focuses on early delivery of business value, continuous improvement of a project’s product and processes, scope flexibility, team input and delivering well-tested products that reflect customer needs.

**NEW! Agility:** The ability for organizations to respond rapidly to changes in internal and external environments without losing momentum or vision.

**Alignment:** Actions to ensure that a process or activity supports the organization’s strategy, goals and objectives.

**American Association for Laboratory Accreditation (A2LA):** An organization that formally recognizes another organization’s competency to perform specific tests, types of tests or calibrations.

**American Customer Satisfaction Index (ACSI):** Released for the first time in October 1994, an economic indicator and cross-industry measure of the satisfaction of U.S. household customers with the quality of the goods and services available to them. This includes goods and services produced in the United States and imports from foreign firms that have substantial market shares or dollar sales. ASQ is a founding sponsor of the ACSI, along with the University of Michigan Business School and the CFI Group.

**American National Standards Institute (ANSI):** A private, nonprofit organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. It is the U.S. member body in the International Organization for Standardization, known as ISO.

**American National Standards Institute-American Society for Quality (ANSI-ASQ):** An organization that accredits certification bodies for ISO 9001 quality management systems, ISO 14001 environmental management systems and other industry specific requirements.

**American Society for Nondestructive Testing (ASNT):** A technical society for nondestructive testing (NDT) professionals.

**American Society for Quality (ASQ):** A professional, not-for-profit association that develops, promotes and applies quality-related information and technology for the private sector, government and academia. ASQ serves individual and organizational members in more than 140 countries.

**American Society for Quality Control (ASQC):** Name of ASQ from 1946 through the middle of 1997, when the name was changed to ASQ.

**American Society for Testing and Materials (ASTM):** Not-for-profit organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems and services.

**American Society for Testing and Materials (ASTM) International:** Not-for-profit organization that provides a forum for the development and publication of voluntary consensus standards for materials, products, systems and services.

**American Society for Training and Development (ASTD):** A membership organization that provides materials, education and support related to workplace learning and performance.

**American standard code for information interchange (ASCII):** The basic computer characters accepted by all American machines and many foreign ones.

**Analysis of means (ANOM):** A statistical procedure for troubleshooting industrial processes and analyzing the results of experimental designs with factors at fixed levels. It provides a graphical display of data. Ellis R. Ott developed the procedure in 1967 because he observed that nonstatisticians had difficulty understanding analysis of variance. Analysis of means is easier for quality practitioners to use because it is an extension of the control chart. In 1973, Edward G. Schilling further extended the concept, enabling analysis of means to be used with non-normal distributions and attributes data in which the normal approximation to the binomial distribution does not apply. This is referred to as analysis of means for treatment effects.

**Analysis of variance (ANOVA):** A basic statistical technique for determining the proportion of influence a factor or set of factors has on total variation. It subdivides the total variation of a data set into meaningful component parts associated with specific sources of variation to test a hypothesis on the parameters of the model or to estimate variance components. There are three models: fixed, random and mixed.

**Andon board:** A production area visual control device, such as a lighted overhead display. It communicates the status of the production system and alerts team members to emerging problems (from “andon,” a Japanese word meaning “light”).

**ANSI ACS X12:** Transaction standards for electronic communication and shipping notification.

**Appraisal cost:** The cost of ensuring an organization is continually striving to conform to customers’ quality requirements.

**Arrow diagram:** A planning tool to diagram a sequence of events or activities (nodes) and their interconnectivity. It is used for scheduling and especially for determining the critical path through nodes.

**AS9100:** An international quality management standard for the aerospace industry published by the Society of Automotive Engineers and other organizations worldwide. It is known as EN9100 in Europe and JIS Q 9100 in Japan. The standard is controlled by the International Aerospace Quality Group (see listing).

**Asia Pacific Laboratory Accreditation Cooperation (APLAC):** A cooperative of laboratory accreditation bodies.

**Assessment:** A systematic evaluation process of collecting and analyzing data to determine the current, historical or projected compliance of an organization to a standard.

**Assignable cause:** A name for the source of variation in a process that is not due to chance and therefore can be identified and eliminated. Also called “special cause.”

**Assn. for Quality and Participation (AQP):** Was an independent organization until 2004, when it became an affiliate organization of ASQ. Continues today as ASQ’s Team and Workplace Excellence Forum.

**Attribute data:** Go/no-go information. The control charts based on attribute data include percent chart, number of affected units chart, count chart, count per unit chart, quality score chart and demerit chart.

**Attributes, method of:** A method of measuring quality that consists of noting the presence (or absence) of some characteristic (attribute) in each of the units under consideration and counting how many units do (or do not) possess it. Example: go/no-go gauging of a dimension.

**Audit:** The on-site verification activity, such as inspection or examination, of a process or quality system to ensure compliance to requirements. An audit can apply to an entire organization or might be specific to a function, process or production step.

**Automotive Industry Action Group (AIAG):** A global automotive trade association with about 2,600-plus member companies that focuses on common business processes, implementation guidelines, education and training.

**Autonomation:** A form of automation in which machinery automatically inspects each item after producing it and ceases production and notifies humans if a defect is detected. Toyota expanded the meaning of jidohka to include the responsibility of all workers to function similarly—to check every item produced and, if a defect is detected, make no more until the cause of the defect has been identified and corrected. Also see “jidohka.”

**Availability:** The ability of a product to be in a state to perform its designated function under stated conditions at a given time.

**Average chart:** A control chart in which the subgroup average, X-bar, is used to evaluate the stability of the process level.

**Average outgoing quality (AOQ):** The expected average quality level of an outgoing product for a given value of incoming product quality.

**Average outgoing quality limit (AOQL):** The maximum average outgoing quality over all possible levels of incoming quality for a given acceptance sampling plan and disposal specification.

**Average run lengths (ARL):** On a control chart, the number of subgroups expected to be inspected before a shift in magnitude takes place.

**Average sample number (ASN):** The average number of sample units inspected per lot when reaching decisions to accept or reject.

**Average total inspection (ATI):** The average number of units inspected per lot, including all units in rejected lots (applicable when the procedure calls for 100% inspection of rejected lots).

B

***Baka-yoke*:** A Japanese term for a manufacturing technique for preventing mistakes by designing the manufacturing process, equipment and tools so an operation literally cannot be performed incorrectly. In addition to preventing incorrect operation, the technique usually provides a warning signal of some sort for incorrect performance. Also see “*poka-yoke*.”

**Balanced plant:** A plant in which the capacity of all resources is balanced exactly with market demand.

**Balanced scorecard:** A management system that provides feedback on internal business processes and external outcomes to continuously improve strategic performance and results.

**Balancing the line:** The process of evenly distributing the quantity and variety of work across available work time, avoiding overburden and underuse of resources. This eliminates bottlenecks and downtime, which translates into shorter flow time.

**Baldrige award:** See “Malcolm Baldrige National Quality Award.”

**Baseline measurement:** The beginning point, based on an evaluation of output over a period of time, used to determine the process parameters prior to any improvement effort; the basis against which change is measured.

**NEW! Basic quality concepts:** Fundamental ideas and tools that define the quality of a product or service. These include fitness for use, histograms, process capability indexes, cause and effect diagrams, failure mode and effects analysis, and control charts.

**Batch and queue:** Producing more than one piece and then moving the pieces to the next operation before they are needed.

**Bayes' theorem:** A formula to calculate conditional probabilities by relating the conditional and marginal probability distributions of random variables.

**Benchmarking:** A technique in which an organization measures its performance against that of best-in-class organizations, determines how those organizations achieved their performance levels and uses the information to improve its own performance. Subjects that can be benchmarked include strategies, operations and processes.

**Benefit-cost analysis:** An examination of the relationship between the monetary cost of implementing an improvement and the monetary value of the benefits achieved by the improvement, both within the same time period.

**Best practice:** A superior method or innovative practice that contributes to the improved performance of an organization, usually recognized as best by other peer organizations.

**Big Q, little q:** A term used to contrast the difference between managing for quality in all business processes and products (big Q) and managing for quality in a limited capacity—traditionally only in factory products and processes (little q).

**Black Belt (BB):** A full-time team leader responsible for implementing process improvement projects—define, measure, analyze, improve and control (DMAIC) or define, measure, analyze, design and verify (DMADV)—within a business to drive up customer satisfaction and productivity levels.

**Blemish:** An imperfection severe enough to be noticed but that should not cause any real impairment with respect to intended normal or reasonably foreseeable use. Also see “defect,” “imperfection” and “nonconformity.”

**Block diagram:** A diagram that shows the operation, interrelationships and interdependencies of components in a system. Boxes, or blocks (hence the name), represent the components; connecting lines between the blocks represent interfaces. There are two types of block diagrams: a functional block diagram, which shows a system’s subsystems and lower level products and their interrelationships and which interfaces with other systems; and a reliability block diagram, which is similar to the functional block diagram but is modified to emphasize those aspects influencing reliability.

**Board of Standards Review (BSR):** An American National Standards Institute board responsible for the approval and withdrawal of American National Standards.

**Body of knowledge (BoK):** The prescribed aggregation of knowledge in a particular area an individual is expected to have mastered to be considered or certified as a practitioner.

**Bottom line:** The essential or salient point; the primary or most important consideration. Also, the line at the bottom of a financial report that shows the net profit or loss.

**NEW! Box and whisker plot:** A plot used in exploratory data analysis to picture the centering and variation of the data based on quartiles. After the data are ordered, the 25th, 50th and 75th percentiles are identified. The box contains the data between the 25th and 75th percentiles.

**Brainstorming:** A technique teams use to generate ideas on a particular subject. Each person on the team is asked to think creatively and write down as many ideas as possible. The ideas are not discussed or reviewed until after the brainstorming session.

**Breakthrough improvement:** A dynamic, decisive movement to a new, higher level of performance.

**BS 7799:** A standard written by British commerce, government and industry stakeholders to address information security management issues, including fraud, industrial espionage and physical disaster. Today, there are three parts to the standard. Part one became ISO/IEC 17799, Information technology—Code of practice for information security management. BS 7799 Part 2 focuses on information security management systems. BS 7799 Part 3 covers risk analysis and management.

**Business process reengineering (BPR):** The concentration on improving business processes to deliver outputs that will achieve results meeting the firm’s objectives, priorities and mission.

C

**Calibration:** The comparison of a measurement instrument or system of unverified accuracy to a measurement instrument or system of known accuracy to detect any variation from the required performance specification.

**Capability:** The total range of inherent variation in a stable process determined by using data from control charts.

**Capability maturity model (CMM):** A framework that describes the key elements of an effective software process. It’s an evolutionary improvement path from an immature process to a mature, disciplined process. The CMM covers practices for planning, engineering and managing software development and maintenance to improve the ability of organizations to meet goals for cost, schedule, functionality and product quality.

**Capacity constraint resources:** A series of non-bottlenecks (based on the sequence in which jobs are performed) that can act as a constraint.

**Cascading:** The continuing flow of the quality message down to, not through, the next level of supervision until it reaches all workers. Also see “deployment.”

**CASCO:** An International Organization for Standardization policy development committee for conformity assessment.

**Cause:** An identified reason for the presence of a defect or problem.

**NEW! Cause analysis:** Another term referring to root cause analysis (see listing).

**Cause and effect diagram:** A tool for analyzing process dispersion. It is also referred to as the “Ishikawa diagram,” because Kaoru Ishikawa developed it, and the “fishbone diagram,” because the complete diagram resembles a fish skeleton. The diagram illustrates the main causes and subcauses leading to an effect (symptom). The cause and effect diagram is one of the “seven tools of quality” (see listing).

**C-chart:** See “count chart.”

**Cell:** An arrangement of people, machines, materials and equipment in which the processing steps are placed next to each other in sequential order and through which parts are processed in a continuous flow. The most common cell layout is a U shape.

**Cellular manufacturing:** Arranging machines in the correct process sequence, with operators remaining within the cell and materials presented to them from outside.

**NEW! CE marking:** Formerly known as the CE Mark, the Conformitè Europëenne (CE) Mark is a mandatory conformity marking for certain products sold within the European Economic Area (EEA) since 1985. The CE marking is also found on products sold outside the EEA that are manufactured in or designed to be sold in the EEA. This makes the CE marking recognizable worldwide even to those unfamiliar with the EEA.

**Centerline:** A line on a graph that represents the overall average (mean) operating level of the process.

**Central tendency:** The tendency of data gathered from a process to cluster toward a middle value somewhere between the high and low values of measurement.

**Certification:** The result of a person meeting the established criteria set by a certificate granting organization.

**Certified biomedical auditor (CBA):** An ASQ certification.

**Certified calibration technician (CCT):** An ASQ certification.

**Certified HACCP auditor (CHA):** An ASQ certification.

**Certified manager of quality/organizational excellence (CMQ/OE):** An ASQ certification; formerly certified quality manager (CQM).

**NEW! Certified pharmaceutical good manufacturing practices (GMP) professional:** An ASQ certification.

**Certified quality auditor (CQA):** An ASQ certification.

**Certified quality engineer (CQE):** An ASQ certification.

**Certified quality improvement associate (CQIA):** An ASQ certification.

**Certified quality inspector (CQI):** An ASQ certification; formerly certified mechanical inspector (CMI).

**Certified quality process analyst (CQPA):** An ASQ certification.

**Certified quality technician (CQT):** An ASQ certification.

**Certified reliability engineer (CRE):** An ASQ certification.

**Certified Six Sigma Black Belt (CSSBB):** An ASQ certification.

**Certified Six Sigma Green Belt (CSSGB):** An ASQ certification.

**NEW! Certified Six Sigma Master Black Belt (CSSMBB):** An ASQ certification.

**NEW! Certified Six Sigma Yellow Belt (CSSYB):** An ASQ certification.

**Certified software quality engineer (CSQE):** An ASQ certification.

**NEW! Certified supplier quality professional (CSQP):** An ASQ certification.

**Chain reaction:** A chain of events described by W. Edwards Deming: improve quality, decrease costs, improve productivity, increase market with better quality and lower price, stay in business, provide jobs and provide more jobs.

**Chain sampling plan:** In acceptance sampling, a plan in which the criteria for acceptance and rejection apply to the cumulative sampling results for the current lot and one or more immediately preceding lots.

**Champion:** A business leader or senior manager who ensures resources are available for training and projects, and who is involved in periodic project reviews; also, an executive who supports and addresses Six Sigma organizational issues.

**Change agent:** An individual from within or outside an organization who facilitates change in the organization; might be the initiator of the change effort, but not necessarily.

**NEW! Change management:** The process, tools and techniques used to manage change, including planning, validating and implementing change, and verifying effectiveness of change.

**Changeover:** A process in which a production device is assigned to perform a different operation or a machine is set up to make a different part—for example, a new plastic resin and new mold in an injection molding machine.

**Changeover time:** The time required to modify a system or workstation, usually including teardown time for the existing condition and setup time for the new condition.

**Characteristic:** The factors, elements or measures that define and differentiate a process, function, product, service or other entity.

**Chart:** A tool for organizing, summarizing and depicting data in graphic form.

**Charter:** A written commitment approved by management stating the scope of authority for an improvement project or team.

**Checklist:** A tool for ensuring all important steps or actions in an operation have been taken. Checklists contain items important or relevant to an issue or situation. Checklists are often confused with check sheets (see listing).

**Check sheet:** A simple data recording device. The check sheet is custom designed by the user, which allows him or her to readily interpret the results. The check sheet is one of the “seven tools of quality” (see listing). Check sheets are often confused with checklists (see listing).

**Classification of defects:** The listing of possible defects of a unit, classified according to their seriousness. Note: Commonly used classifications: class A, class B, class C, class D; or critical, major, minor and incidental; or critical, major and minor. Definitions of these classifications require careful preparation and tailoring to the product(s) being sampled to ensure accurate assignment of a defect to the proper classification. A separate acceptance sampling plan is generally applied to each class of defects.

**Closed-loop corrective action (CLCA):** A sophisticated engineering system to document, verify and diagnose failures, recommend and initiate corrective action, provide follow-up and maintain comprehensive statistical records. Code of conduct: Expectations of behavior mutually agreed on by a team.

**Common causes:** Causes of variation that are inherent in a process over time. They affect every outcome of the process and everyone working in the process. Also see “special causes.”

**Company culture:** A system of values, beliefs and behaviors inherent in a company. To optimize business performance, top management must define and create the necessary culture.

**Complaint tracking:** Collecting data, disseminating them to appropriate persons for resolution, monitoring complaint resolution progress and communicating results.

**Compliance:** The state of an organization that meets prescribed specifications, contract terms, regulations or standards.

**Computer aided design (CAD):** A type of software used by architects, engineers, drafters and artists to create precision drawings or technical illustrations. CAD software can be used to create 2-D drawings or 3-D models.

**Computer aided engineering (CAE):** A broad term used by the electronic design automation industry for the use of computers to design, analyze and manufacture products and processes. CAE includes CAD (see listing) and computer aided manufacturing (CAM), which is the use of computers for managing manufacturing processes.

**Concurrent engineering (CE):** A way to reduce cost, improve quality and shrink cycle time by simplifying a product’s system of life cycle tasks during the early concept stages.

**Conflict resolution:** The management of a conflict situation to arrive at a resolution satisfactory to all parties.

**Conformance:** An affirmative indication or judgment that a product or service has met the requirements of a relevant specification, contract or regulation.

**Conformitè Europëenne Mark (CE Mark):** A European Union (EU) conformity mark for regulating the goods sold within its borders. The mark represents a manufacturer’s declaration that products comply with EU New Approach Directives. These directives apply to any country that sells products within the EU.

**Conformity assessment:** All activities concerned with determining that relevant requirements in standards or regulations are fulfilled, including sampling, testing, inspection, certification, management system assessment and registration, accreditation of the competence of those activities and recognition of an accreditation program’s capability.

**Consensus:** A state in which all the members of a group support an action or decision, even if some of them don’t fully agree with it.

**Constraint:** Anything that limits a system from achieving higher performance or throughput; also, the bottleneck that most severely limits the organization’s ability to achieve higher performance relative to its purpose or goal.

**Constraints management:** See “theory of constraints.”

**Consultant:** An individual who has experience and expertise in applying tools and techniques to resolve process problems and who can advise and facilitate an organization’s improvement efforts.

**Consumer:** The external customer to whom a product or service is ultimately delivered; also called end user.

**Consumer's risk:** Pertains to sampling and the potential risk that bad products will be accepted and shipped to the consumer.

**Continuous flow production:** A method in which items are produced and moved from one processing step to the next, one piece at a time. Each process makes only the one piece that the next process needs, and the transfer batch size is one. Also referred to as one-piece flow and single-piece flow.

**Continuous improvement (CI):** Sometimes called continual improvement. The ongoing improvement of products, services or processes through incremental and breakthrough improvements.

**Continuous quality improvement (CQI):** A philosophy and attitude for analyzing capabilities and processes and improving them repeatedly to achieve customer satisfaction.

**Continuous sampling plan:** In acceptance sampling, a plan, intended for application to a continuous flow of individual units of product, that involves acceptance and rejection on a unit-by-unit basis and employs alternate periods of 100% inspection and sampling. The relative amount of 100% inspection depends on the quality of submitted product. Continuous sampling plans usually require that each t period of 100% inspection be continued until a specified number, i, of consecutively inspected units are found clear of defects. Note: For single level continuous sampling plans, a single d sampling rate (for example, inspect one unit in five or one unit in 10) is used during sampling. For multilevel continuous sampling plans, two or more sampling rates can be used. The rate at any time depends on the quality of submitted product.

**Control chart:** A time sequenced chart with upper and lower control limits on which values of some statistical measure for a series of samples or subgroups are plotted. The chart frequently shows a central line to help detect a trend of plotted values toward either control limit.

**Control limits:** The natural boundaries of a process within specified confidence levels, expressed as the upper control limit (UCL) and the lower control limit (LCL).

**Control plan (CP):** Written descriptions of the systems for controlling part and process quality by addressing the key characteristics and engineering requirements.

**Coordinate measuring machine (CMM):** A device that dimensionally measures 3-D products, tools and components with an accuracy approaching 0.0001 inches.

**NEW! Corporate governance:** The system of rules, practices and processes that directs and controls an organization. In essence, corporate governance involves balancing the interests of an organization’s many stakeholders, such as shareholders, management, customers, suppliers, financiers, government and the community.

**Corrective action:** A solution meant to reduce or eliminate an identified problem.

**Corrective action recommendation (CAR):** The full cycle corrective action tool that offers ease and simplicity for employee involvement in the corrective action/process improvement cycle.

**Correlation (statistical):** A measure of the relationship between two data sets of variables.

**Cost of poor quality (COPQ):** The costs associated with providing poor quality products or services. There are four categories: internal failure costs (costs associated with defects found before the customer receives the product or service), external failure costs (costs associated with defects found after the customer receives the product or service), appraisal costs (costs incurred to determine the degree of conformance to quality requirements) and prevention costs (costs incurred to keep failure and appraisal costs to a minimum).

**Cost of quality (COQ):** Another term for COPQ. It is considered by some to be synonymous with COPQ but is considered by others to be unique. While the two concepts emphasize the same ideas, some disagree as to which concept came first and which categories are included in each.

**Count chart:** A control chart for evaluating the stability of a process in terms of the count of events of a given classification occurring in a sample; known as a “c-chart.”

**Count per unit chart:** A control chart for evaluating the stability of a process in terms of the average count of events of a given classification per unit occurring in a sample, known as a “u-chart.”

**Cp:** The ratio of tolerance to 6 sigma, or the upper specification limit (USL) minus the lower specification limit (LSL) divided by 6 sigma. It is sometimes referred to as the engineering tolerance divided by the natural tolerance and is only a measure of dispersion.

**Cpk index:** Equals the lesser of the USL minus the mean divided by 3 sigma (or the mean) minus the LSL divided by 3 sigma. The greater the Cpk value, the better.

**Critical processes:** Processes that present serious potential dangers to human life, health and the environment, or that risk the loss of significant sums of money or customers.

**Cross functional:** A term used to describe a process or an activity that crosses the boundary between functions. A cross functional team consists of individuals from more than one organizational unit or function.

**Cross pilot:** See “scatter diagram.”

**Cultural resistance:** A form of resistance based on opposition to the possible social and organizational consequences associated with change.

**Culture change:** A major shift in the attitudes, norms, sentiments, beliefs, values, operating principles and behavior of an organization.

**Culture, organizational:** A common set of values, beliefs, attitudes, perceptions and accepted behaviors shared by individuals within an organization.

**Cumulative sum control chart (CUSUM):** A control chart on which the plotted value is the cumulative sum of deviations of successive samples from a target value. The ordinate of each plotted point represents the algebraic sum of the previous ordinate and the most recent deviations from the target.

**Current good manufacturing practices (CGMP):** Regulations enforced by the U.S. Food and Drug Administration for food and chemical manufacturers and packagers.

**Customer:** See “external customer” and “internal customer.”

**Customer delight:** The result of delivering a product or service that exceeds customer expectations.

**NEW! Customer experiment:** Using a given customer type to test whether a proposed new product will be accepted by customers. Also referred to as a pilot study.

**Customer relationship management (CRM):** A strategy for learning more about customers’ needs and behaviors to develop stronger relationships with them. It brings together information about customers, sales, marketing effectiveness, responsiveness and market trends. It helps businesses use technology and human resources to gain insight into the behavior of customers and the value of those customers.

**Customer satisfaction:** The result of delivering a product or service that meets customer requirements.

**Customer-supplier model (CSM):** A model depicting inputs flowing into a work process that, in turn, add value and produce outputs delivered to a customer. Also called customer-supplier methodology.

**Customer-supplier partnership:** A long-term relationship between a buyer and supplier characterized by teamwork and mutual confidence. The supplier is considered an extension of the buyer’s organization. The partnership is based on several commitments. The buyer provides long-term contracts and uses fewer suppliers. The supplier implements quality assurance processes so incoming inspection can be minimized. The supplier also helps the buyer reduce costs and improve product and process designs.

**Cycle:** A sequence of operations repeated regularly.

**Cycle time:** The time required to complete one cycle of an operation. If cycle time for every operation in a complete process can be reduced to equal *takt* time, products can be made in single-piece flow. Also see “*takt* time.”

D

**Data:** A set of collected facts. There are two basic kinds of numerical data: measured or variable data, such as “16 ounces,” “4 miles” and “0.75 inches”; and counted or attribute data, such as “162 defects.”

**NEW! Data collection and analysis:** The process to determine what data are to be collected, how the data are collected and how the data are to be analyzed.

**NEW! Data collection and analysis tools:** A set of tools that help with data collection and analysis. These tools include check sheets, spreadsheets, histograms, trend charts and control charts.

**D chart:** See “demerit chart.”

**NEW! Decision making:** The thought process of selecting a choice from the available options.

**Decision matrix:** A matrix teams use to evaluate problems or possible solutions. For example, a team might draw a matrix to evaluate possible solutions, listing them in the far-left vertical column. Next, the team selects criteria to rate the possible solutions, writing them across the top row. Then, each possible solution is rated on a scale of 1 to 5 for each criterion, and the rating is recorded in the corresponding grid. Finally, the ratings of all the criteria for each possible solution are added to determine its total score. The total score is then used to help decide which solution deserves the most attention.

**Defect:** A product’s or service’s nonfulfillment of an intended requirement or reasonable expectation for use, including safety considerations. There are four classes of defects: class 1, very serious, leads directly to severe injury or catastrophic economic loss; class 2, serious, leads directly to significant injury or significant economic loss; class 3, major, is related to major problems with respect to intended normal or reasonably foreseeable use; and class 4, minor, is related to minor problems with respect to intended normal or reasonably foreseeable use. Also see “blemish,” “imperfection” and “nonconformity.”

**Defective:** A defective unit; a unit of product that contains one or more defects with respect to the quality characteristic(s) under consideration.

**Delighter:** A feature of a product or service that a customer does not expect to receive but that gives pleasure to the customer when received. Also called an “exciter.”

**Demerit chart:** A control chart for evaluating a process in terms of a demerit (or quality score); in other words, a weighted sum of counts of various classified nonconformities.

**Deming cycle:** Another term for the plan-do-study-act cycle. Walter Shewhart created it (calling it the plan-do-check-act cycle), but W. Edwards Deming popularized it, calling it plan-do-study-act. Also see “plan-do-check-act cycle."

**Dependability:** The degree to which a product is operable and capable of performing its required function at any randomly chosen time during its specified operating time, provided that the product is available at the start of that period. (Nonoperation related influences are not included.) Dependability can be expressed by the ratio: time available / (time available + time required).

**Deployment:** Dispersion, dissemination, broadcasting or spreading communication throughout an organization, downward and laterally. Also see “cascading.”

**Design for Six Sigma (DFSS):** See “DMADV.”

**Design of experiments (DoE):** A branch of applied statistics dealing with planning, conducting, analyzing and interpreting controlled tests to evaluate the factors that control the value of a parameter or group of parameters.

**Deviation:** In numerical data sets, the difference or distance of an individual observation or data value from the center point (often the mean) of the set distribution.

**Diagnosis:** The activity of discovering the cause(s) of quality deficiencies; the process of investigating symptoms, collecting and analyzing data, and conducting experiments to test theories to determine the root cause(s) of deficiencies.

**Diagnostic journey and remedial journey:** A two-phase investigation used by teams to solve chronic quality problems. In the first phase, the diagnostic journey, the team journeys from the symptom of a chronic problem to its cause. In the second phase, the remedial journey, the team journeys from the cause to its remedy

**DMADV:** A data driven quality strategy for designing products and processes, it is an integral part of a Six Sigma quality initiative. It consists of five interconnected phases: define, measure, analyze, design and verify.

**DMAIC:** A data driven quality strategy for improving processes and an integral part of a Six Sigma quality initiative. DMAIC is an acronym for define, measure, analyze, improve and control.

**Dodge-Romig sampling plans:** Plans for acceptance sampling developed by Harold F. Dodge and Harry G. Romig. Four sets of tables were published in 1940: single sampling lot tolerance tables, double sampling lot tolerance tables, single sampling average outgoing quality limit tables and double sampling average outgoing quality limit tables.

**Driving forces:** Forces that tend to change a situation in desirable ways.

E

**Effect:** The result of an action being taken; the expected or predicted impact when an action is to be taken or is proposed.

**Effectiveness:** 1) The state of having produced a decided upon or desired effect. 2) A measure of the appropriateness of the goals chosen and the degree to which they are achieved.

**Efficiency:** The state of being efficient (see entry). Also the ratio of the useful work performed in a process to the total resources required.

**Efficient:** Achieving maximum productivity with the optimal resources.

**NEW! Eight disciplines (8D) model:** A problem-solving approach to identify, correct and eliminate recurring problems.

**Eight wastes:** Taiichi Ohno originally enumerated seven wastes (*muda*) and later added underutilized people as the eighth waste commonly found in physical production. The eight are: 1) overproduction ahead of demand; 2) waiting for the next process, worker, material or equipment; 3) unnecessary transport of materials (for example, between functional areas of facilities, or to or from a stockroom or warehouse); 4) over-processing of parts due to poor tool and product design; 5) inventories more than the absolute minimum; 6) unnecessary movement by employees during the course of their work (such as to look for parts, tools, prints or help); 7) production of defective parts; 8) under-utilization of employees’ brainpower, skills, experience and talents.

**Eighty-twenty (80-20):** A term referring to the Pareto principle, which was first defined by Joseph M. Juran in 1950. The principle suggests most effects come from relatively few causes; that is, 80% of the effects come from 20% of the possible causes. Also see “Pareto chart.”

**Electric data interchange (EDI):** The electronic exchange of data from customers to suppliers and from suppliers to customers.

**NEW! Employee empowerment (EE):** A condition whereby employees have the authority to make decisions and take action in their work areas, within stated bounds, without prior approval.

**Employee involvement (EI):** An organizational practice whereby employees regularly participate in making decisions on how their work areas operate, including suggestions for improvement, planning, goal setting and monitoring performance.

**EN 46000:** A European quality management system standard for the medical device industry. Technically equivalent to ISO 13485:1996, an international medical device standard.

**EN 9100:** A European quality management standard for the aerospace industry. Considered the technical equivalent of AS9100.

**End user:** See “consumer.” Someone who purchases products or services for their own use.

**NEW! Environmental management system:** A set of processes and practices that enable an organization to reduce its environmental impacts and promote environmental sustainability.

**Equipment availability:** The percentage of time during which a process (or equipment) is available to run. This can sometimes be called uptime. To calculate operational availability, divide the machine’s operating time during the process by the net available time (production time / potential production time) x 100.

**Error detection:** A hybrid form of error proofing. It means a bad part can be made but will be caught immediately, and corrective action will be taken to prevent another bad part from being produced. A device is used to detect and stop the process when a bad part is made. This is used when error proofing is too expensive or not easily implemented.

**Error proofing:** Improving designs to prevent mistakes from being made. Contrasted with mistake proofing, which is improving processes to prevent mistakes from being made or passed downstream. Some consider the terms to be synonymous, however, and applicable to both products and processes.

**Ethics:** The practice of applying a code of conduct based on moral principles to day-to-day actions to balance what is fair to individuals or organizations with what is right for society.

**European Cooperation for Accreditation (EA):** A cooperative organization of accreditation bodies.

**Exciter:** See “delighter.”

**Exemplar Global:** A U.S. certification body for personnel certification or training course certification.

**Expectations:** The act or state of expecting. To wait in expectation of, or looking forward or anticipating. Also, customers’ perceptions about how an organization’s products and services will meet their specific needs and requirements.

**Experimental design:** In quality management, a plan for conducting an experiment that includes considerations such as which conditions, factors, responses, tools and treatments are to be included or used.

**External customer:** A person or organization that receives a product, service or information but is not part of the organization supplying it. Also see “internal customer.”

**External failure:** A nonconformance identified by a source outside of the producing organization. Discovered after a product or service has been passed downstream, for example, to users or customers.

**External setup:** Setup procedures that can be performed safely while machines or equipment are in motion. Also known as outer exchange of die. Also see “internal setup.”

F

**Facilitator:** A specifically trained person who functions as a teacher, coach and moderator for a group, team or organization.

**Failure:** The inability of an item, product or service to perform required functions on demand due to one or more defects.

**Failure cost:** The cost resulting from the occurrence of defects. One element of cost of quality or cost of poor quality. These costs can be categorized as internal or external.

**Failure mode analysis (FMA):** A procedure to determine which malfunction symptoms appear immediately before or after a failure of a critical parameter in a system or product. After all possible causes are listed for each symptom, the product is designed to eliminate the problems.

**Failure mode effects analysis (FMEA):** A systematized group of activities to recognize and evaluate the potential failure of a product or process and its effects, identify actions that could eliminate or reduce the occurrence of the potential failure and document the process.

**Failure mode effects and criticality analysis (FMECA):** A procedure performed after a failure mode effects analysis to classify each potential failure effect according to its severity and probability of occurrence.

**Feedback:** Communication of information from customers or users related to a process or performance. Feedback is used to make decisions directed toward improving or adjusting a process or performance as necessary.

**Feeder lines:** A series of special assembly lines that allow assemblers to perform preassembly tasks off the main production line. Performing certain processes off the main production line means fewer parts in the main assembly area, the availability of service ready components and assemblies in the main production area, improved quality and less lead time to build a product.

**First in, first out (FIFO):** An inventory management method in which the oldest materials put into storage are the next materials taken out of storage for use.

**First pass yield (FPY):** Also referred to as the quality rate, the percentage of units that completes a process and meets quality guidelines without being scrapped, rerun, retested, returned or diverted into an offline repair area. FPY is calculated by dividing the units entering the process minus the defective units by the total number of units entering the process.

**First time quality (FTQ):** Calculation of the percentage of good parts at the beginning of a production run.

**Fishbone diagram:** See “cause and effect diagram.”

**Fitness for use:** A term sometimes used to define the term “quality” to indicate the degree to which a product or service meets the requirements for its intended use.

**Five-phase lean approach:** A systematic method for implementing lean manufacturing that helps improve the production process and sustains gains made in the production cycle in an area or plant. The five phases are: 1) stability (provides an environment with controlled process variables, decreased waste and increased business impact); 2) continuous flow (characterized by reduced work in process inventory, time loss and defects, and increased process flexibility and repeatable processes between workstations); 3) synchronous production (characterized by disciplined process repeatability and synchronization between operations and customer requirements); 4) pull system (creates an environment in which material replenishment links operations with customer demand); and 5) level production (reduces response time or changes in demand and upstream schedule variability).

**Five S's (5S):** Five Japanese terms beginning with “s” used to create a workplace suited for visual control and lean production. *Seiri* means to separate needed tools, parts and instructions from unneeded materials and to remove the unneeded ones. *Seiton* means to neatly arrange and identify parts and tools for ease of use. *Seiso* means to conduct a cleanup campaign. *Seiketsu* means to conduct *seiri*, *seiton* and *seiso* daily to maintain a workplace in perfect condition. *Shitsuke* means to form the habit of always following the first four S’s. The Americanized version is “sort, straighten, scrub, standardize and sustain.” The 5S approach organizes the workplace, keeps it neat and clean, establishes standardized condition and maintains discipline to sustain the effort.

**Five whys:** A technique for discovering the root causes of a problem and showing the relationship of causes by repeatedly asking the question, “Why?” A repetitive questioning technique to probe deeper to surface the root cause of a problem. The number of times “why” is asked depends on when the true root cause is reached.

**Flow:** The progressive achievement of tasks along the value stream so a product proceeds from design to launch, order to delivery and raw to finished materials in the hands of the customer with no stoppages, scrap or backflows.

**Flowchart:** A graphical representation of the steps in a process. Flowcharts are drawn to better understand processes. One of the “seven tools of quality” (see listing).

**Focus group:** A qualitative discussion group, usually of eight to 10 people, that is invited from a segment of the customer base to discuss an existing or planned product, service or process, led by a facilitator working from predetermined questions.

**Force field analysis:** A technique for analyzing what aids or hinders an organization in reaching an objective. An arrow pointing to an objective is drawn down the middle of a piece of paper. The factors that will aid the objective’s achievement, called the driving forces, are listed on the left side of the arrow. The factors that will hinder its achievement, called the restraining forces, are listed on the right side of the arrow.

**14 Points:** W. Edwards Deming’s 14 management practices to help organizations increase their quality and productivity: 1) create constancy of purpose for improving products and services; 2) adopt the new philosophy; 3) cease dependence on inspection to achieve quality; 4) end the practice of awarding business on price alone; instead, minimize total cost by working with a single supplier; 5) improve constantly and forever every process for planning, production and service; 6) institute training on the job; 7) adopt and institute leadership; 8) drive out fear; 9) break down barriers between staff areas; 10) eliminate slogans, exhortations and targets for the workforce; 11) eliminate numerical quotas for the workforce and numerical goals for management; 12) remove barriers that rob people of pride of workmanship, and eliminate the annual rating or merit system; 13) institute a rigorous program of education and self-improvement for everyone; and 14) put everybody in the organization to work to accomplish the transformation.

**Frequency distribution (statistical):** A table that graphically presents a large volume of data so the central tendency (such as the average or mean) and distribution are clearly displayed.

**Function:** A group of related actions contributing to a larger action.

**Functional layout:** The practice of grouping machines (such as grinding machines) or activities (such as order entry) by type of operation performed.

**Functional verification:** Testing to ensure a part conforms to all engineering performance and material requirements.

**Funnel experiment:** An experiment that demonstrates the effects of tampering. Marbles are dropped through a funnel in an attempt to hit a flat-surfaced target below. The experiment shows that adjusting a stable process to compensate for an undesirable result or an extraordinarily good result will produce output that is worse than if the process had been left alone.

G

**Gage repeatability and reproducibility (GR&R):** The evaluation of a gauging instrument’s accuracy by determining whether its measurements are repeatable (there is close agreement among a number of consecutive measurements of the output for the same value of the input under the same operating conditions) and reproducible (there is close agreement among repeated measurements of the output for the same value of input made under the same operating conditions over a period of time).

**Gain sharing:** A reward system that shares the monetary results of productivity gains among owners and employees.

**Gantt chart:** A matrix-type horizontal bar chart used in process/project planning and control to display planned and finished work in relation to time. It is called a milestone chart when interim checkpoints are added.

**Gap analysis:** The comparison of a current condition to the desired state.

**Gatekeeper:** A timekeeper; in team meetings, a designated individual who helps monitor the team’s use of allocated time.

**Geometric dimensioning and tolerancing (GD&T):** A set of rules and standard symbols to define part features and relationships on an engineering drawing depicting the geometric relationship of part features and allowing the maximum tolerance that permits full function of the product.

**George M. Low Trophy:** An award presented by NASA to NASA aerospace industry contractors, subcontractors and suppliers that consistently maintain and improve the quality of their products and services. George M. Low was the NASA administrator for nearly three decades.

**NEW! Global quality:** The systematic design and implementation of quality processes across the world, based on information-sharing and best practices.

**Goal:** A broad statement describing a desired future condition or achievement without being specific about how much and when.

**Go/no-go:** State of a unit or product. Two parameters are possible: go (conforms to specifications) and no-go (does not conform to specifications).

**Good laboratory practices (GLP):** A quality system (for example, 21 CFR, part 58) for labs and organizations to use to ensure the uniformity, consistency, reliability, reproducibility, quality and integrity of testing performed. Promoted by the Organization for Economic Co-operation and Development (OECD) and some regulatory agencies in the world.

**Good manufacturing practices (GMP):** A minimum set of practices recommended or required by some regulatory agencies (for example, 21 CFR, parts 808, 812 and 820) for manufacturers to meet to ensure their products consistently meet requirements for their intended use.

**Green Belt (GB):** An employee who has been trained in the Six Sigma improvement method and can lead a process improvement or quality improvement team as part of his or her full-time job.

**Group dynamic:** The interaction (behavior) of individuals within a team meeting.

**Groupthink:** A situation in which critical information is withheld from the team because individual members censor or restrain themselves, either because they believe their concerns are not worth discussing or because they are afraid of confrontation. Occurs when most or all team members coalesce in supporting an idea or decision that hasn’t been fully explored.

H

**Hawthorne effect:** When people modify their behavior in response to their awareness of being observed. This term is attributed to sociologist Henry Landsberger, who analyzed this behavior during experiments at the Hawthorne Works, a Western Electric factory outside Chicago.

**Hazard analysis and critical control point (HACCP):** A quality management system for effectively and efficiently ensuring farm-to-table food safety in the United States. HACCP regulations for various sectors are established by the Department of Agriculture and the Food and Drug Administration.

***Heijunka*:** A method of leveling production, usually at the final assembly line, that makes just-in-time production possible. It involves averaging the volume and sequence of different model types on a mixed model production line. Using this method avoids excessive batching of different types of product and volume fluctuations in the same product. Also see “production smoothing.”

**Highly accelerated life test (HALT):** A process for uncovering design defects and weaknesses in electronic and mechanical assemblies using a vibration system combined with rapid high and low temperature changes. The purpose of HALT is to optimize product reliability by identifying the functional and destructive limits of a product at an early stage in product development.

**Highly accelerated stress audits (HASA):** A technique in which a sample of parts (as opposed to 100% of the production, as in HASS) is subjected to stresses similar to the levels and duration for HALT. In monitoring the production process, the intent of HASA is to detect slight shifts in the attributes of the product so corrective actions can be taken and implemented before the performance of outgoing product approaches the specifications.

**Highly accelerated stress screening (HASS):** A technique for production screening that rapidly exposes process or production flaws in products. Its purpose is to expose a product to optimized production screens without affecting product reliability. Unlike HALT, HASS uses nondestructive stresses of extreme temperatures and temperature change rates with vibration.

**Histogram:** A graphic summary of variation in a set of data. The pictorial nature of a histogram lets people see patterns that are difficult to detect in a simple table of numbers. One of the “seven tools of quality” (see listing).

**Honorary member, ASQ:** ASQ’s highest grade of membership. As specified in ASQ’s constitution, “An honorary member shall have rendered acknowledged eminent service to the quality profession or the allied arts and sciences.” To attain this level, an individual must be nominated by at least 10 regular members and must be approved unanimously by the board of directors.

***Hoshin kanri*:** The selection of goals, projects to achieve the goals, designation of people and resources for project completion and establishment of project metrics. Also see “policy deployment.”

***Hoshin* planning:** Breakthrough planning. A Japanese strategic planning process in which an organization develops up to four vision statements that indicate where the organization should be in the next five years. Organizational goals and work plans are developed based on the vision statements. Periodic submitted audits are then conducted to monitor progress. Also see “value stream.”

**Hotelling's T2 model:** A multivariate profile for detecting differential expressions in microarrays.

**House of quality:** A product planning matrix, somewhat resembling a house, that is developed during quality function deployment and shows the relationship of customer requirements to the means of achieving these requirements.

I

**IATF 16949:** A harmonized set of supplier quality management system requirements for automotive suppliers released in October 2016 by the International Automotive Task Force (IATF). IATF 16949 replaced ISO/TS 16949.

**NEW! Idea creation tools:** Tools that encourage thinking and organization of new ideas around issues or opportunities, either individually or with other people. Examples are brainstorming, the Delphi method, role-playing, TRIZ and visioning.

**Imagineering:** Developing in the mind’s eye a process without waste.

**Imperfection:** A quality characteristic’s departure from its intended level or state without any association to conformance to specification, requirements or to the usability of a product or service. Also see “blemish,” “defect” and “nonconformity.”

**Improvement:** The positive effect of a process change effort.

**In-control process:** A process in which the statistical measure being evaluated is in a state of statistical control; in other words, the variations among the observed sampling results can be attributed to a constant system of chance causes. Also see “out-of-control process.”

**Incremental improvement:** Improvement implemented on a continual basis.

**Indicators:** Established measures to determine how well an organization is meeting its customers’ needs and other operational and financial performance expectations.

**Information flow:** The dissemination of information for taking a specific product from order entry through detailed scheduling to delivery. Also see “value stream.”

**Informative inspection:** A form of inspection for determining nonconforming product. Also see “judgment inspection.”

**NEW! Innovation:** New value created at an optimal cost—not at any cost—through the development of new products, services or processes.

**Inputs:** The products, services and material obtained from suppliers to produce the outputs delivered to customers.

**Inspection:** A verification activity. For example, measuring, examining, testing and gauging one or more characteristics of a product or service and comparing the results with specified requirements to determine whether conformity is achieved for each characteristic.

**Inspection, 100%:** Inspection of all the units in the lot or batch.

**Inspection cost:** The cost associated with inspecting a product to ensure it meets the internal or external customer’s needs and requirements; an appraisal cost.

**Inspection, curtailed:** Sampling inspection in which inspection of the sample is stopped as soon as a decision is certain. Thus, as soon as the rejection number for defectives is reached, the decision is certain and no further inspection is necessary. In single sampling, however, the whole sample is usually inspected in order to have an unbiased record of quality history. This same practice is usually followed for the first sample in double or multiple sampling.

**Inspection lot:** A collection of similar units or a specific quantity of similar material offered for inspection and acceptance at one time.

**Inspection, normal:** Inspection used in accordance with a sampling plan under ordinary circumstances.

**Inspection, reduced:** Inspection in accordance with a sampling plan requiring smaller sample sizes than those used in normal inspection. Reduced inspection is used in some inspection systems as an economy measure when the level of submitted quality is sufficiently good and other stated conditions apply. Note: The criteria for determining when quality is “sufficiently good” must be defined in objective terms for any given inspection system.

**Inspection, tightened:** Inspection in accordance with a sampling plan that has stricter acceptance criteria than those used in normal inspection. Tightened inspection is used in some inspection systems as a protective measure when the level of submitted quality is sufficiently poor. The higher rate of rejections is expected to lead suppliers to improve the quality of submitted product. Note: The criteria for determining when quality is “sufficiently poor” must be defined in objective terms for any given inspection system.

**Instant pudding:** A term used to illustrate an obstacle to achieving quality, or the supposition that quality and productivity improvement are achieved quickly through an affirmation of faith rather than through sufficient effort and education.

**Inter-American Accreditation Cooperation (IAAC):** A cooperative organization of accreditation bodies.

**Intermediate customers:** Organizations or individuals who operate as distributors, brokers or dealers between the supplier and the consumer or end user.

**Internal customer:** The recipient (person or department) within an organization of another person’s or department’s output (product, service or information). Also see “external customer.”

**Internal failure:** A product failure that occurs before the product is passed downstream—for example, delivered to external customers.

**Internal setup:** Setup procedures that must be performed while a machine or piece of equipment is stopped; also known as inner exchange of die. Also see “external setup.”

**International Accreditation Registry (IAR):** A not-for-profit organization that accredits training and certification program results to international standards and guidelines.

**International Aerospace Quality Group (IAQG):** An international nonprofit aerospace and defense industry legal entity (registered in Brussels) to continuously improve the industry’s processes used by its supply chain to consistently deliver high-quality products or services and to make significant improvements in quality performance and reductions in cost.

**International Automotive Task Force (IATF):** An ad hoc group of automotive manufacturers (for example, General Motors, Ford, Fiat Chrysler Automobiles, BMW, Volkswagen and Renault) and their respective trade associations (for example, Automotive Industry Action Group, the German Association of the Automotive Industry and the Society of Motor Manufacturers & Traders) formed to provide improved quality products to automotive customers worldwide.

**International Laboratory Accreditation Cooperation (ILAC):** A cooperative organization of laboratory accreditation bodies.

**International Organization for Standardization (ISO):** An independent, nongovernmental international organization with a membership of 161 national standards bodies that unites experts to share knowledge and develop voluntary, consensus-based, market-relevant international standards, guidelines and other types of documents.

**Interrelationship diagram:** A management tool that depicts the relationship among factors in a complex situation; also called “interrelationship diagram” or “relations diagram.”

**Intervention:** The action of a team facilitator when interrupting a discussion to state observations about group dynamics or the team process.

**Inventory:** A term for assets (for example, materials, supplies, work in process and finished goods) held by an organization.

**Ishikawa diagram:** See “cause and effect diagram.”

**ISO 14000:** A series of international, voluntary environmental management standards, guides and technical reports developed by the International Organization for Standardization (ISO).

**NEW! ISO 14001:** A voluntary environmental management standard developed by the International Organization for Standardization (ISO).

**NEW! ISO 19011:** A guideline for the auditing of management system standards developed by the International Organization for Standardization (ISO).

**ISO 26000:** An international standard developed by the International Organization for Standardization (ISO) to help organizations effectively assess and address those social responsibilities that are relevant and significant to their mission and vision; operations and processes; customers, employees, communities and other stakeholders; and environmental impact.

**ISO 9000 series standards:** A set of international standards on quality management and quality assurance developed to help organizations effectively document the quality system elements to be implemented to maintain an efficient quality system. The standards, initially published in 1987, are not specific to any particular industry, product or service. The standards were developed by the International Organization for Standardization (ISO) (see listing). The standards underwent major revision in 2000 and now include ISO 9000:2005 (definitions), ISO 9001:2008 (requirements), ISO 9004:2009 (continuous improvement) and ISO 9001: 2015 (risk management).

**NEW! ISO 9001:** A voluntary quality management system standard developed by the International Organization for Standardization (ISO). First released in 1987 and one of several documents in the ISO 9000 family.

J

***Jidohka*:** Stopping a line automatically when a defective part is detected. Any necessary improvements can then be made by directing attention to the stopped equipment and the worker who stopped the operation. The *jidohka* system puts faith in the worker as a thinker and allows all workers the right to stop the line on which they are working. Also see “autonomation.”

**JISQ 9100:** An international quality management standard for the aerospace industry. Also see AS9100.

**Job instruction:** Quality system documentation that describes work conducted in one function in an organization, such as setup, inspection, rework or operator.

**The Joint Commission:** A U.S. healthcare accreditation body; formerly known as Joint Commission for the Accreditation of Healthcare Organizations.

**Judgment inspection:** A U.S. healthcare accreditation body; formerly known as Joint Commission for the Accreditation of Healthcare Organizations.

**Juran trilogy:** Three managerial processes identified by Joseph M. Juran for use in managing for quality: quality planning, quality control and quality improvement.

**Just-in-time (JIT) manufacturing:** An optimal material requirement planning system for a manufacturing process in which there is little or no manufacturing material inventory on hand at the manufacturing site and little or no incoming inspection.

**Just-in-time (JIT) training:** The provision of training only when it is needed to all but eliminate the loss of knowledge and skill caused by a lag between training and use.

K

***Kaizen*:** A Japanese term that means gradual, unending improvement by doing little things better and setting and achieving increasingly higher standards. Masaaki Imai made the term famous in his book, *Kaizen: The Key to Japan’s Competitive Success*.

***Kanban*:** A method for providing material/product to a succeeding operation by signaling the preceding operation when more material/product is needed. This “pull” type of process control employs a *kanban*, a card or signboard, attached to a lot of material/product in a production line signifying the delivery of a given quantity. When all of the material/product has been processed, the card/sign is returned to its source, where it becomes an order to replenish.

**NEW! Kano model:** Three classes of customer requirements, as described by Noriaki Kano: satisfiers—what customers say they want; dissatisfiers—what customers expect and what results in dissatisfaction when not present; and delighters/exciters—new or unexpected features that customers do not expect.

**Key performance indicator (KPI):** A statistical measure of how well an organization is doing in a particular area. A KPI could measure an organization’s financial performance or how it is holding up against customer requirements.

**Key process:** A major system level process that supports the mission and satisfies major consumer requirements.

**Key process characteristic:** A process parameter that can affect safety or compliance with regulations, fit, function, performance or subsequent processing of product.

**Key product characteristic:** A product characteristic that can affect safety or compliance with regulations, fit, function, performance or subsequent processing of product.

**Key results area:** Customer requirements that are critical for the organization’s success.

**Kitting:** A process in which assemblers are supplied with kits—a box of parts, fittings and tools—for each task they perform. This eliminates time-consuming trips from one parts bin, tool crib or supply center to another to get necessary materials.

**Kruskal-Wallis test:** A nonparametric test to compare three or more samples. It tests the null hypothesis that all populations have identical distribution functions against the alternative hypothesis that at least one of the samples differs only with respect to location (median), if at all. It is the analogue to the F-test used in analysis of variance. While analysis of variance tests depend on the assumption that all populations under comparison are normally distributed, the Kruskal-Wallis test places no such restriction on the comparison. It is a logical extension of the Wilcoxon Mann-Whitney Test (see listing).

L

**Laboratory/lab:** A facility that can perform calibration services, test validation and testing (for example, chemical, metallurgical, dimensional, physical, electrical and reliability testing).

**Laboratory scope:** A record containing the specific tests, evaluations and calibrations a laboratory has the ability and competency to perform, the list of equipment it uses, and a list of the methods and standards to which it adheres to each of these.

**Last off part comparison:** A comparison of the last part off a production run with a part off the next production run to verify that the quality level is equivalent.

**Layout inspection:** The complete measurement of all dimensions shown on a design record.

**Leadership:** The action of leading a group of people or an organization, an essential part of a quality improvement effort.

**Lead time:** The total time a customer must wait to receive a product after placing an order.

**Lean:** A systematic method for waste elimination or minimization (muda) within a manufacturing system without sacrificing productivity.

**Lean enterprise:** An organization that has eliminated or minimized waste (muda).

**Lean manufacturing/production:** An initiative focused on eliminating all waste in manufacturing processes. Principles of lean manufacturing include zero waiting time, zero inventory, scheduling (internal customer pull instead of push system), batch to flow (cut batch sizes), line balancing and cutting actual process times. The production systems are characterized by optimum automation, just-in-time supplier delivery disciplines, quick changeover times, high levels of quality and continuous improvement.

**Lean migration:** The journey from traditional manufacturing methods to one in which all forms of waste are systematically eliminated.

**Level loading:** A technique for balancing production throughput over time. Life cycle stages: Design, manufacturing, assembly, installation, operation and shutdown periods of product development

**Listening post:** An individual who, by virtue of his or her potential for having contact with customers, is designated to collect, document and transmit pertinent feedback to a central collection authority in the organization.

**Load-load:** A method of conducting single-piece flow in which the operator proceeds from machine to machine, taking the part from one machine and loading it into the next. The lines allow different parts of a production process to be completed by one operator, eliminating the need to move around large batches of work-in-progress inventory.

**Lost customer analysis:** Analysis conducted to determine why a customer or a class of customers was lost.

**Lot:** 1) A defined quantity of product accumulated under conditions considered uniform for sampling purposes. 2) Items constituting a defined quantity of uniform product for purposes of proceeding collectively through a process.

**Lot, batch:** A definite quantity of some product manufactured under conditions of production that are considered uniform.

**Lot quality:** The value of percentage defective or of defects per hundred units in a lot.

**Lot size (also referred to as N):** The number of units in a lot.

**Lot tolerance percentage defective (LTPD):** Expressed in percentage defective, the poorest quality in an individual lot that should be accepted. Note: LTPD is used as a basis for some inspection systems and is commonly associated with a small consumer risk.

**Lower control limit (LCL):** Control limit for points below the central line in a control chart.

M

**Maintainability:** The probability that a given maintenance action for an item under given usage conditions can be performed within a stated time interval when the maintenance is performed under stated conditions using stated procedures and resources. Maintainability has two categories: serviceability (the ease of conducting scheduled inspections and servicing) and repairability (the ease of restoring service after a failure).

**Malcolm Baldrige National Quality Award (MBNQA):** An award established by the U.S. Congress in 1987 to raise awareness of quality management and recognize U.S. organizations that have implemented successful quality management systems. The award is managed by the U.S. Commerce Department National Institute of Standards and Technology and administered by ASQ.

**Management review:** A top management meeting held at planned intervals to review the continuing suitability and effectiveness of one or more of an organization’s management system(s).

**Manager:** An individual with responsibility and authority over managing a process.

**Manufacturing resource planning (MRP II):** When material requirements planning and capacity planning and finance interface to translate operational planning into financial terms and into a simulation tool to assess alternative production plans.

**Mapping symbols or icons:** An easy, effective way to visually communicate the flow of materials and information.

**Master Black Belt (MBB):** A problem-solving subject matter expert responsible for strategic implementations in an organization. This person is typically qualified to teach other facilitators the statistical and problem-solving methods, tools and applications to use in such implementations.

**Material handling:** Methods, equipment and systems for conveying materials to various machines and processing areas, and for transferring finished parts to assembly, packaging and shipping areas.

**Material requirements planning (MRP):** A computerized system typically used to determine the quantity and timing requirements for production and delivery of items to customers and suppliers. Using MRP to schedule production at various processes will result in push production because any predetermined schedule is an estimate only of what the next process will actually need.

**Matrix:** A document for displaying the relationships among various data sets.

**Mean:** A measure of central tendency; the arithmetic average of all measurements in a data set.

**Mean time between failures (MTBF):** The average time interval between failures for a repairable machine, piece of equipment or product for a defined unit of measure; for example, operating hours, cycles and miles.

**Measure:** The criteria, metric or means to which a comparison is made with output.

**Measurement:** The act or process of determining a value. An approximation or estimate of the value of the specific quantity subject to measurement, which is complete only when accompanied by a quantitative statement of its uncertainty.

**Measurement system:** All operations, procedures, devices and other equipment, personnel and environment used to assign a value to the characteristic being measured.

**Measurement uncertainty:** In metrology, a non-negative parameter characterizing the dispersion of the values attributed to a measured quantity.

**Median:** The middle number or center value of a set of data in which all the data are arranged in sequence.

**Metric:** A standard for measurement.

**Metrology:** The science of weights and measures or of measurement; a system of weights and measures.

**MIL-Q-9858A:** A military standard that describes quality program requirements.

**MIL-STD-105E:** A military standard that describes the sampling procedures and tables for inspection by attributes.

**MIL-STD-45662A:** A military standard that describes the requirements for creating and maintaining a calibration system for measurement and test equipment.

**Mission:** An organization’s purpose.

**Mistake proofing:** Improving processes to prevent mistakes from being made or passed downstream. This term can be contrasted with error proofing, which means improving designs to prevent mistakes from being made. Some, however, consider these two terms synonymous and applicable to products and processes.

**Mode:** The value occurring most frequently in a data set.

**Monument:** Any design, scheduling or production technology with scale requirements that call for designs, orders and products to be brought to the machine to wait in line for processing. The opposite of a right sized (see listing) machine.

***Muda*:** Japanese for waste; any activity that consumes resources but creates no value for the customer.

**Multivariate control chart:** A control chart for evaluating the stability of a process in terms of the levels of two or more variables or characteristics.

**NEW! Multivoting:** A technique used to make a consensus decision when numerous alternatives exist or when those involved in making or approving the decision have differing opinions. Similar to nominal group technique (see listing).

**Mutual recognition agreement (MRA):** A formal agreement providing reciprocal recognition of the validity of other organizations’ deliverables, typically found in voluntary standards and conformity assessment groups.

**Myers-Briggs type indicator (MBTI):** A method and instrument for identifying an individual’s personality type based on Carl Jung’s theory of personality preferences.

N

**n:** The number of units in a sample.

**N:** The number of units in a population.

**Nagara system:** Smooth production flow, ideally one piece at a time, characterized by synchronization (balancing) of production processes and maximum use of available time; includes overlapping of operations where practical. A nagara production system is one in which seemingly unrelated tasks can be produced simultaneously by the same operator.

**National Institute of Standards and Technology (NIST):** An agency of the U.S. Department of Commerce that develops and promotes measurements, standards and technology, and manages the Malcolm Baldrige National Quality Award.

**Natural team:** A team of individuals with common or similar responsibilities and authorities drawn from a single workgroup. Similar to a process improvement team except that it is not cross functional in composition and it is usually permanent.

**NEW! New management planning tools:** Method(s) for achieving expected outcomes that previously have not been used.

**Next operation as customer:** The concept of internal customers in which every operation is both a receiver and a provider.

**NEW! Nine windows:** A tool used to investigate a past or potential problem at the super-system and subsystem levels, in addition to considering the problem only in the present and at the system level.

**Nominal group technique:** A technique, similar to brainstorming, to generate ideas on a particular subject. Team members are asked to silently write down as many ideas as possible. Each member is asked to share one idea per round, which is recorded. After all ideas are recorded, they are discussed and prioritized by the group.

**Nonconforming record (NCR):** A permanent record for accounting and preserving the knowledge of a nonconforming condition.

**Nonconformity:** The nonfulfillment of a specified requirement. Also see “blemish,” “defect” and “imperfection.”

**Nondestructive testing and evaluation (NDT, NDE):** Testing and evaluation methods that do not damage or destroy the test specimen.

**Nonlinear parameter estimation:** A method whereby the arduous and labor-intensive task of multiparameter model calibration can be carried out automatically under the control of a computer.

**Nonparametric tests:** All tests involving ranked data (data that can be put in order). Nonparametric tests are often used in place of their parametric counterparts when certain assumptions about the underlying population are questionable.

**Nonvalue added:** A term that describes a process step or function that is not required for the direct achievement of process output. This step or function is identified and examined for potential elimination. In a contractual situation, it can be those features or process steps that a customer would be unwilling to pay for if given the option. Also see “value added.”

**Norm (behavioral):** Expectations of how a person or persons will behave in a given situation based on established protocols, rules of conduct or accepted social practices.

**Normal distribution (statistical):** The charting of a data set in which most of the data points are concentrated around the average (mean), thus forming a bell-shaped curve.

**Number of affected units chart:** A control chart for evaluating the stability of a process in terms of the total number of units in a sample in which an event of a given classification occurs.

O

**Objective:** A target or goal to be achieved.

**One-piece flow:** The opposite of batch and queue; instead of building many products and then holding them in line for the next step in the process, products go through each step in the process one at a time, without interruption.

**One-touch exchange of dies:** The reduction of die setup to a single step. Also see “single-minute exchange of dies,” “internal setup” and “external setup.”

**Operating characteristic curve (OC curve):** A graph to determine the probability of accepting lots as a function of the lots’ or processes’ quality level when using various sampling plans. There are three types: type A curves, which give the probability of acceptance for an individual lot coming from finite production (will not continue in the future); type B curves, which give the probability of acceptance for lots coming from a continuous process; and type C curves, which (for a continuous sampling plan) give the long-run percentage of product accepted during the sampling phase.

**Operating expenses:** The money required for a system to convert inventory into throughput.

**Operations:** Work or steps to transform raw materials to finished product.

**NEW! Organizational excellence:** Achievement by an organization of consistent superior performance—for example, outputs that exceed meeting objectives, needs or expectations.

**Original equipment manufacturer (OEM):** An organization that uses product components from one or more other organizations to build a product that it sells under its own organization name and brand.

**Out-of-control process:** A process in which the statistical measure being evaluated is not in a state of statistical control. In other words, the variations among the observed sampling results cannot be attributed to a constant system of chance causes. Also see “in-control process.”

**Out of spec:** A term that indicates a unit does not meet a given requirement or specification.

**Outputs:** Products, materials, services or information provided to customers (internal or external) from a process.

**Overall equipment effectiveness (OEE):** A value of how well a manufacturing unit performs relative to its designed capacity during the periods when it is scheduled to run. The product of a machine’s operational availability, performance efficiency and first-pass yield.

P

**Painted floor:** A lean manufacturing technique to provide visual control (for example, to indicate a nonconforming material area or to determine stock levels).

**Parallel operation:** A technique to create economy of scale by having two operators work together to perform tasks on either side of a machine. Using this technique reduces the time it takes a single operator to move from one side to the other, making the overall process more efficient. An example of parallel operation is having two people work on a changeover, supplementing each other’s work effort.

**Pareto chart:** A graphical tool for ranking causes from most significant to least significant. It is based on the Pareto principle, named after 19th century economist Vilfredo Pareto, and suggests that most effects come from relatively few causes; that is, 80% of the effects come from 20% of the possible causes. Also known as the "80-20 rule" (see listing). One of the “seven tools of quality” (see listing).

**Partnership/alliance:** A strategy and a formal relationship between a supplier and a customer that engenders cooperation for the benefit of both parties.

**Parts per million (PPM):** A metric reporting the number of defects normalized to a population of one million for ease of comparison.

**P chart:** See “percent chart.”

**PDCA cycle:** See “plan-do-check-act cycle.”

**Percent chart:** A control chart for evaluating the stability of a process in terms of the percentage of the total number of units in a sample in which an event of a given classification occurs. Also referred to as a proportion chart.

**Performance standard:** The metric against which a complete action is compared.

**Physical transformation task:** A step taking a specific product from raw materials to a finished product delivered to the customer. Also see “value stream” and “information flow.”

**Pitch:** The pace and flow of a product.

**Plan-do-check-act (PDCA) cycle:** A four-step process for quality improvement. In the first step (plan), a way to effect improvement is developed. In the second step (do), the plan is carried out. In the third step (check), a study takes place between what was predicted and what was observed in the previous step. In the last step (act), action should be taken to correct or improve the process.

**Point *kaizen*:** See “process *kaizen*.”

**Point of use:** The place where or the time when a product or service is used.

**Poisson distribution:** A discrete probability distribution that expresses the probability of a number of events occurring in a fixed time period if these events occur with a known average rate, and are independent of the time since the last event.

***Poka-yoke*:** Japanese term that means mistake proofing. A *poka-yoke* device is one that prevents incorrect parts from being made or assembled or easily identifies a flaw or error. See “mistake proofing.”

**Policy:** A plan (direction), statement of intent or commitment for achieving an objective.

**Precision:** The amount of variation that exists in the values of multiple measurements of the same characteristic or parameter. Greater precision means less variation between measurements.

**Prevention cost:** The cost incurred by actions taken to prevent a nonconformance from occurring; one element of cost of quality. See “cost of quality.”

**Prevention versus detection:** A term used to contrast two types of quality activities. Prevention refers to activities for preventing nonconformances in products and services. Detection refers to activities for detecting nonconformances already in products and services.

**Preventive action:** Action taken to prevent occurrence of nonconformances.

**Probability (statistical):** The likelihood of occurrence of an event, action or item.

**Probability of rejection:** The probability that a product or lot will be rejected.

**Problem solving:** The act of solving a problem.

**Procedure:** A particular way of accomplishing an expected outcome.

**Process:** A set of interrelated work activities that transform inputs into outputs.

**NEW! Process analysis:** A study of the inputs, steps and outputs of a process. Generally used to improve the understanding of the process to determine methods to correct, control or improve the process’ effectiveness and efficiency.

**Process average quality:** Expected or average value of process quality.

**Process capability:** A statistical measure of the inherent process variability of a given characteristic.

**Process capability index:** The value of the tolerance specified for the characteristic divided by the process capability. The several types of process capability indexes include the widely used Cpk and Cp.

**Process control:** The method for ensuring that a process meets specified requirements.

**NEW! Process decision program chart (PDPC):** A type of tree diagram used for the systematic analysis of a process to identify process risks and countermeasures to take to avoid or mitigate those risks. Also see "tree diagram."

**Process flow diagram:** A visual depiction, generally using symbols, of the flow of materials or information through a process. Also called a process flowchart.

**Process improvement:** Actions taken to increase the effectiveness or efficiency of a process in meeting specified requirements.

**Process improvement team:** A structured group often made up of cross functional members who work together to improve a process or processes.

**Process *kaizen*:** Improvements made at an individual process or in a specific area. Sometimes called “point *kaizen*.”

**Process management:** Activities undertaken to manage processes; typically involves planning, communicating, monitoring, measuring or control methods.

**Process map:** A type of flowchart visually depicting the steps in a process.

**Process owner:** The person who has responsibility and authority for ensuring that a process meets specified requirements and achieves objectives.

**Process performance management (PPM):** The overseeing of process instances to ensure their quality and timeliness; can also include proactive and reactive actions to ensure a good result.

**Process quality:** The degree to which process results meet specified requirements.

**Process re-engineering:** A strategy of rethinking and redesigning a process; often referred to as the “clean sheet of paper” approach.

**NEW! Process view of work:** The understanding that work can be viewed as a “process” which has inputs, steps and output(s) and that a process has interfaces with other processes.

**NEW! Product audit:** A systematic and independent examination of a product to gather objective evidence to determine the degree of conformance to specified requirements.

**Production (analysis) board:** A job site board on which production results are compared with targets or where other related production information is posted. An example of visual management.

**Production part approval process (PPAP):** A customer part qualification process for purchased parts or materials that are to be used in the customer’s final product. Customer PPAP approval, or a deviation, is required before shipping the purchased parts or materials to the customer for use in their production process. Its purpose is to determine whether all customer engineering design record requirements are properly understood by the supplier and that the process has the potential to produce product consistently meeting these requirements.

**Production smoothing:** Keeping total manufacturing volume as constant as possible. Also see “*heijunka*.”

**Productivity:** A measurement of output for a given amount of input.

**Product or service liability:** The obligation of an organization to make restitution for loss related to personal injury, property damage or other harm caused by its product or service.

**Product warranty:** An organization’s stated policy that it will replace, repair or reimburse a buyer for a product if a product defect occurs under certain conditions and within a stated period of time.

**Profound knowledge, system of:** Defined by W. Edwards Deming, a system that consists of an appreciation for systems, knowledge of variation, theory of knowledge and understanding of psychology.

**Project management:** The application of knowledge, skills, tools and techniques to a broad range of activities to meet the specified requirements of a particular project.

**NEW! Project planning tools:** Methods for the systematic arranging, sequencing and scheduling of project's tasks.

**Project team:** Manages the work of a project. The work typically involves balancing competing demands for project scope, time, cost, risk and quality, satisfying stakeholders with differing needs and expectations, and meeting identified requirements.

**Proportion chart:** See ”percent chart.”

**Pull system:** An inventory management system based on replenishing inventory based on use rather than a schedule or forecast. Also see “*kanban*.”

Q

**QEDS Standards Group:** The U.S. Standards Group on Quality, Environment, Dependability and Statistics consists of the members and leadership of organizations concerned with the development and effective use of generic and sector specific standards on quality control, assurance and management; environmental management systems and auditing, dependability and the application of statistical methods.

**Q9000 series:** Refers to ANSI/ISO/ASQ Q9000 series of standards, which is the verbatim American adoption of the 2000 edition of the ISO 9000 series of standards.

**Qualitician:** Someone who functions as a quality practitioner and a quality technician.

**Quality:** A subjective term for which each person or sector has its own definition. In technical usage, quality can have two meanings: 1) the characteristics of a product or service that bear on its ability to satisfy stated or implied needs; 2) a product or service free of deficiencies. According to Joseph Juran, quality means “fitness for use”; according to Philip Crosby, it means “conformance to requirements.”

**Quality assurance/quality control (QA/QC):** Two terms that have many interpretations because of the multiple definitions for the words “assurance” and “control.” For example, “assurance” can mean the act of giving confidence, the state of being certain or the act of making certain; “control” can mean an evaluation to indicate needed corrective responses, the act of guiding or the state of a process in which the variability is attributable to a constant system of chance causes. (For a detailed discussion on the multiple definitions, see *ANSI/ISO/ASQ A3534-2, Statistics—Vocabulary and Symbols—Statistical Quality Control*.) One definition of quality assurance is: all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality. One definition for quality control is: the operational techniques and activities used to fulfill requirements for quality. Often, however, “quality assurance” and “quality control” are used interchangeably, referring to the actions performed to ensure the quality of a product, service or process.

**Quality audit:** A systematic, independent process of gathering objective evidence to determine whether audit criteria are being met. Audits are based on a sample and are independent of the system, process or product being audited, unlike verification activities, which are part of a process.

**Quality circle:** A quality improvement or self-improvement study group composed of a small number of employees (10 or fewer) and their supervisor. Quality circles originated in Japan, where they are called quality control circles.

**Quality control:** See “quality assurance/quality control.”

**Quality costs:** The total costs of quality-related activities. Generally considered to be the sum of prevention, appraisal, internal and external failure costs.

**Quality engineering:** The analysis of a manufacturing system at all stages to maximize the quality of the process itself and the products it produces.

**Quality Excellence for Suppliers of Telecommunications (QuEST) Forum:** A partnership of telecommunications suppliers and service providers. The QuEST Forum developed TL 9000 (see listing).

**Quality function deployment (QFD):** A structured method in which customer needs or expectations are translated into appropriate technical requirements for each stage of product development and production. The QFD process is often referred to as listening to the voice of the customer.

**Quality loss function:** A parabolic approximation of the quality loss that occurs when a quality characteristic deviates from its target value. The quality loss function is expressed in monetary units: the cost of deviating from the target increases quadratically the farther the quality characteristic moves from the target. The formula used to compute the quality loss function depends on the type of quality characteristic being used. The quality loss function was first introduced in this form by Genichi Taguchi.

**Quality management (QM):** Managing activities and resources of an organization to achieve objectives and prevent nonconformances.

**Quality management system (QMS):** A formal system that documents the structure, processes, roles, responsibilities and procedures required to achieve effective quality management.

**Quality plan:** Documented information that provides the activities or methods to be taken to achieve objectives and meet specified requirements.

**Quality policy:** A documented statement of commitment or intent to be implemented to achieve quality.

**Quality rate:** See “first pass yield.”

**Quality score chart:** A chart for evaluating the stability of a process. The quality score is the weighted sum of the count of events of various classifications in which each classification is assigned a weight.

**Quality tool:** An instrument or technique to support and improve the activities of quality management and improvement.

**Quality trilogy:** A three-pronged approach to managing for quality. The three legs are quality planning (developing the products and processes required to meet customer needs), quality control (meeting product and process goals) and quality improvement (achieving unprecedented levels of performance).

**Queue time:** The time a product spends in a line awaiting the next design, order processing or fabrication step.

**Quick changeover:** The ability to change tooling and fixtures rapidly (usually within minutes) so multiple products can be run on the same machine.

**Quincunx:** A tool that creates frequency distributions. Beads tumble over numerous horizontal rows of pins, which force the beads to the right or left. After a random journey, the beads are dropped into vertical slots. After many beads are dropped, a frequency distribution results. Quincunxes are often used in classrooms to simulate a manufacturing process. The quincunx was invented by English scientist Francis Galton in the 1890s.

R

**RAM:** Reliability/availability/maintainability (see individual entries).

**Random cause:** A cause of variation due to chance and not assignable to any factor.

**Random sampling:** A commonly used sampling technique in which sample units are selected so all combinations of n units under consideration have an equal chance of being selected as the sample.

**Range (statistical):** The measure of dispersion in a data set (the difference between the highest and lowest values).

**Range chart (R chart):** A control chart in which the subgroup range, R, evaluates the stability of the variability within a process.

**NEW! Recall:** The act of officially summoning someone or something back to its place of origin.

**Red bead experiment:** An exercise developed by W. Edwards Deming to illustrate that results are largely dependent on the management system—which is owned by top management—and not the employees who work in the system

**Re-engineering:** A process for restructuring an entire organization and its processes.

**Registrar:** Generally accepted equivalent term for “certification body.”

**Registration:** The act of including an organization, product, service or process in a compilation of those having the same or similar attributes.

**Registration to standards:** A process in which an accredited, independent third-party organization conducts an on-site audit of an organization's operations against the requirements of the standard to which the organization wants to be registered. Upon successful completion of the audit, the organization receives a certificate indicating it has met the standard requirements. In countries outside the United States, this generally is known as certification.

**Regression analysis:** A statistical technique for determining the best mathematical expression describing the functional relationship between one response and one or more independent variables.

**Rejection number:** The smallest number of defectives (or defects) in the sample or samples under consideration that will require rejection of the lot.

**Relations diagram:** See "interrelations diagram."

**Reliability:** The probability of a product performing its intended function under stated conditions without failure for a given period of time.

**Repeatability:** The variation in measurements obtained when one measurement device is used several times by the same person to measure the same characteristic on the same product.

**Reproducibility:** The variation in measurements made by different people using the same measuring device to measure the same characteristic on the same product.

**Requirements:** A need or expectation, generally mandatory or compulsory.

**Resource utilization:** Using a resource in a way that increases throughput.

**Results:** Outcomes that can be qualitative or quantitative.

**Right size:** Matching tooling and equipment to the job and space requirements of lean production. Right sizing is a process that challenges the complexity of equipment by examining how equipment fits into an overall vision for workflow through a factory. When possible, right sizing favors smaller, dedicated machines rather than large, multipurpose batch processing ones.

**Right the first time:** Meeting specified requirements with the initial attempt.

**Risk management:** The identification, evaluation and prioritization of risks to eliminate or mitigate their probability or severity or to leverage opportunities.

**Robustness:** The condition of a product or process design that remains relatively stable, with a minimum of variation, even though factors that influence operations or usage, such as environment and wear, are constantly changing.

**Root cause:** A factor that caused a nonconformance and should be addressed with corrective action.

**NEW! Root cause analysis:** The method of identifying the cause of a problem, solving it and preventing it from occurring again. Uncovering the correct and accurate reason(s) why something is happening or has already occurred.

**Run chart:** A chart showing a line connecting numerous data points collected from a process running over time.

**Runner:** A person on the production floor who paces the entire value stream through the pickup and delivery of materials through *kanban* (see listing) usage.

S

**SAE International:** Professional organization of individual engineers and related disciplines; formerly Society for Automotive Engineers.

**NEW! Safety:** The state of being free from harm or danger.

**Sample:** In acceptance sampling, one or more units of product (or a quantity of material) drawn from a lot for purposes of inspection to reach a decision regarding acceptance of the lot.

**Sample size [n]:** The number of units in a sample.

**Sample standard deviation chart (S chart):** A control chart in which the subgroup standard deviation, s, is used to evaluate the stability of the variability within a process.

**Sampling at random:** As commonly used in acceptance sampling theory, the process of selecting sample units so all units under consideration have the same probability of being selected. Note: Equal probabilities are not necessary for random sampling; what is necessary is that the probability of selection be ascertainable. However, the stated properties of published sampling tables are based on the assumption of random sampling with equal probabilities. An acceptable method of random selection with equal probabilities is the use of a table of random numbers in a standard manner.

**Sampling, double:** Sampling inspection in which the inspection of the first sample leads to a decision to accept a lot, reject it or take a second sample; the inspection of a second sample, when required, then leads to a decision to accept or reject the lot.

**Sampling, multiple:** Sampling inspection in which, after each sample is inspected, the decision is made to accept a lot, reject it or take another sample. But there is a prescribed maximum number of samples, after which a decision to accept or reject the lot must be reached. Note: Multiple sampling as defined here has sometimes been called “sequential n sampling” or “truncated sequential e sampling.” The term “multiple sampling” is recommended.

**Sampling, single:** Sampling inspection in which the decision to accept or reject a lot is based on the inspection of one sample.

**Sampling, unit:** Sequential sampling inspection in which, after each unit is inspected, the decision is made to accept a lot, reject it or inspect another unit.

**Sanitizing:** English translation of *seiso*, one of the Japanese five S’s used for workplace organization. Sanitizing (also referred to as shining or sweeping) is the act of cleaning the work area. Dirt is often the root cause of premature equipment wear, safety problems and defects.

**Satisfier:** A term used to describe the quality level received by a customer when a product or service meets expectations.

**Scatter diagram:** A graphical technique to analyze the relationship between two variables. Two sets of data are plotted on a graph, with the y-axis being used for the variable to be predicted and the x-axis being used for the variable to make the prediction. The graph will show possible relationships (although two variables might appear to be related, they might not be; those who know most about the variables must make that evaluation). One of the “seven tools of quality” (see listing).

**Scientific management/approach:** A term referring to the intent to find and use the best way to perform tasks to improve quality, productivity and efficiency.

**Scorecard:** An evaluation device, usually in the form of a questionnaire, that specifies the criteria customers will use to rate your business’ performance in satisfying customer requirements.

***Seiban*:** The name of a Japanese management practice taken from the words *sei*, which means manufacturing, and ban, which means number. A *seiban* number is assigned to all parts, materials and purchase orders associated with a particular customer job, project or anything else. This enables a manufacturer to track everything related to a particular product, project or customer, and facilitates setting aside inventory for specific projects or priorities. That makes it an effective practice for project and build-to-order manufacturing.

**Self-directed work team (SDWT):** A type of team structure in which much of the decision making regarding how to handle the team’s activities is controlled by the team members themselves.

**Sentinel event:** A healthcare term for any event not consistent with the desired, normal or usual operation of the organization; also known as an adverse event.

**Service level agreement:** A formal agreement between an internal provider and an internal receiver (customer).

**NEW! Seven new management and planning tools:** Tools to promote innovation, communicate information and successfully plan major projects. The tools are: affinity diagrams, matrix diagrams, interrelationship digraphs, process decision program charts, tree diagrams, activity network diagrams and prioritization matrixes.

**Seven tools of quality:** Tools that help organizations understand their processes to improve them. The tools are the cause and effect diagram, check sheet, control chart, flowchart, histogram, Pareto chart and scatter diagram (see individual entries).

**Seven wastes:** See “eight wastes.”

**Shadow board:** A visual management tool painted to indicate where tools belong and which tools are missing.

**NEW! Shainin System:** Named after its developer, Dorian Shainin, this problem-solving system focuses on identifying the dominant cause of process variation called the Red X. Also called statistical engineering.

**Shewhart cycle:** See “plan-do-check-act cycle.”

**Sifting:** English translation of Japanese *seiri*, one of the five S’s used for workplace organization. Sifting is separating the essential from the nonessential. It involves screening through unnecessary materials and simplifying the work environment.

**Sigma:** One standard deviation in a normally distributed process.

**Signal to noise ratio (S/N ratio):** An equation that indicates the magnitude of an experimental effect above the effect of experimental error due to chance fluctuations.

**Simulation:** A 3-D technique to balance a line. It involves using cardboard, wood and plastic foam to create full-sized equipment mock-ups that can be easily moved to obtain an optimum layout.

**Single-minute exchange of dies:** A series of techniques pioneered by Shigeo Shingo for changeovers of production machinery in less than 10 minutes. The long-term objective is always zero setup, in which changeovers are instantaneous and do not interfere in any way with continuous flow. Setup in a single minute is not required, but used as a reference (see “one-touch exchange of dies,” “internal setup” and “external setup”).

**Single-piece flow:** A process in which products proceed, one complete product at a time, through various operations in design, order taking and production without interruptions, backflows or scrap.

**SIPOC diagram:** A tool used by Six Sigma process improvement teams to identify all relevant elements (suppliers, inputs, process, outputs, customers) of a process improvement project before work begins.

**Six Sigma quality:** A term generally used to indicate process capability in terms of process spread measured by standard deviations in a normally distributed process.

**NEW! Six Sigma tools:** The problem-solving tools used to support Six Sigma and other process improvement efforts. This includes voice of the customer, value stream mapping, process mapping, capability analysis, Pareto charts, root cause analysis, failure mode and effects analysis, control plans, statistical process control, 5S, mistake proofing and design of experiments.

**NEW! Small business:** Privately owned corporations, partnerships or sole proprietorships that have fewer employees and less annual revenue than a regular-sized business or corporation. The definition of “small”—in terms of being able to apply for government support and qualify for preferential tax policy—varies by country and industry.

**NEW! Social responsibility:** The concept that business entities should balance profit-making activities with activities that benefit society.

**Software quality assurance (SQA):** A systematic approach to evaluating the quality of and adherence to software product standards, processes and procedures. SQA includes ensuring standards and procedures are established and followed throughout the software acquisition life cycle.

**Sort:** English translation of the Japanese word *seiri*, one of the five S’s (see listing) used for workplace organization. Sorting (also referred to as structuring or sifting) involves organizing essential materials. It helps the operator find materials when needed.

**NEW! Spaghetti diagram:** A visual representation using a continuous flow line tracing the path of an item or activity through a process. The continuous flow line enables process teams to identify redundancies in workflow and opportunities to expedite process flow.

**Special causes:** Causes of variation that arise because of special circumstances. They are not an inherent part of a process. Special causes are also referred to as assignable causes. Also see “common causes.”

**Special characteristic:** Automotive ISO TS 16949 term for key product or process characteristics.

**Specification:** A document that states the requirements to which a given product or service must conform.

**Sponsor:** The person who supports a team’s plans, activities and outcomes.

**Stages of team growth:** Four stages that teams move through as they develop maturity: forming, storming, norming and performing.

**Stakeholder:** Any individual, group or organization that will have a significant impact on or will be significantly impacted by the quality of a specific product or service.

**Standard:** The metric, specification, gauge, statement, category, segment, grouping, behavior, event or physical product sample against which the outputs of a process are compared and declared acceptable or unacceptable.

**Standard deviation (statistical):** A computed measure of vari- ability indicating the spread of the data set around the mean.

**Standard in-process stock:** One of the three elements that make up standard work. It is the minimum quantity of parts always on hand for processing during and between subprocesses. It allows workers to do their jobs continuously in a set sequence, repeating the same operation over and over in the same order. Also see “standard work.”

**Standardization:** When policies and common procedures are used to manage processes throughout the system. Also, English translation of the Japanese word *seiketsu*, one of the Japanese five S’s (see listing) used for workplace organization.

**Standard work:** A precise description of each work activity, specifying cycle time, *takt* time, the work sequence of specific tasks and the minimum inventory of parts on hand needed to conduct the activity. All jobs are organized around human motion to create an efficient sequence without waste. Work organized in such a way is called standard(ized) work. The three elements that make up standard work are takt time, working sequence and standard in-process stock (see individual listings).

**Standard work instructions:** A lean manufacturing tool that enables operators to observe a production process with an understanding of how assembly tasks are to be performed. It ensures the quality level is understood and serves as an excellent training aid, enabling replacement or temporary individuals to easily adapt and perform the assembly operation.

**Statistical process control (SPC):** The application of statistical techniques to control a process; often used interchangeably with the term “statistical quality control” (see listing).

**Statistical quality control (SQC):** The application of statistical techniques to control quality. Often used interchangeably with the term “statistical process control” (see listing), although statistical quality control includes acceptance sampling, which statistical process control does not.

**Statistics:** A field that involves tabulating, depicting and describing data sets; a formalized body of techniques characteristically involving attempts to infer the properties of a large collection of data from inspection of a sample of the collection.

**Stop the line authority:** Power given to workers to stop the process when abnormalities occur, allowing them to prevent the defect or variation from being passed along.

**Strategic planning:** The process an organization uses to envision its future and develop the appropriate strategies, goals, objectives and action plans.

**NEW! Stratification:** The act of sorting data, people and objects into distinct groups or layers.

**Strengths, weaknesses, opportunities, threats (SWOT) analysis:** A strategic technique used to assess what an organization is facing.

**Stretch goals:** A set of goals designed to position an organization to meet future requirements.

**Structural variation:** Variation caused by regular, systematic changes in output, such as seasonal patterns and long-term trends.

**Suboptimization:** A condition in which gains made in one activity are offset by losses in another activity or activities that are caused by the same actions that created gains in the first activity.

**Supermarket:** The storage locations of parts before they go on to the next operation. Supermarkets are managed by predetermined maximum and minimum inventory levels. Each item in the plant is at a designated location.

**Supplier:** A source of materials, service or information input provided to a process.

**NEW! Supplier quality:** A supplier’s ability to deliver goods or services that will satisfy customers’ needs.

**Supplier quality assurance:** Confidence a supplier's product or service will fulfill its customers’ needs. This confidence is achieved by creating a relationship between the customer and supplier that ensures the product will be fit for use with minimal corrective action and inspection. According to Joseph M. Juran, nine primary activities are needed: 1) define product and program quality requirements; 2) evaluate alternative suppliers; 3) select suppliers; 4) conduct joint quality planning; 5) cooperate with the supplier during the execution of the contract; 6) obtain proof of conformance to requirements; 7) certify qualified suppliers; 8) conduct quality improvement programs as required; and 9) create and use supplier quality ratings.

**NEW! Supplier quality management:** A system in which supplier quality is managed by using a proactive and collaborative approach. This management approach begins early in the product design and supplier selection process. It continues through the entire life cycle of a product and for the duration of the relationship with that particular supplier.

**Supply chain:** The series of suppliers to a given process.

**Surveillance:** The continual monitoring of a process; a type of periodic assessment or audit conducted to determine whether a process continues to perform to a predetermined standard.

**Survey:** The act of examining a process or questioning a selected sample of individuals to obtain data about a process, product or service.

**Sustain:** The English translation of *shitsuke*, one of the five S’s (see listing) used for workplace organization. Sustaining (also referred to as self-disciplining) is the continuation of sorting, setting in order and sanitizing. It addresses the need to perform 5S on an ongoing and systematic basis.

**Symptom:** An observable phenomenon arising from and accompanying a defect.

**System:** A group of interdependent processes and people that together perform a common mission.

**System *kaizen*:** Improvement aimed at an entire value stream.

T

**Taguchi Methods:** The American Supplier Institute’s trademarked term for the quality engineering methodology developed by Genichi Taguchi. In this engineering approach to quality control, Taguchi calls for off-line quality control, on-line quality control and a system of experimental design to improve quality and reduce costs.

***Takt* time:** The rate of customer demand, *takt* time is calculated by dividing production time by the quantity of product the customer requires in that time. *Takt* is the heartbeat of a lean manufacturing system. Also see “cycle time.”

**Tampering:** Action taken to compensate for variation within the control limits of a stable system; tampering increases rather than decreases variation, as evidenced in the funnel experiment.

**Task:** A specific, definable activity to perform an assigned piece of work, often finished within a certain time.

**Team:** A group of individuals organized to work together to accomplish a specific objective.

**Technical report (TR):** A type of document in the International Organization for Standardization portfolio of deliverables.

**Technical specification (TS):** A type of document in the International Organization for Standardization portfolio of deliverables.

**Theory of constraints (TOC):** A lean management philosophy that stresses removal of constraints to increase throughput while decreasing inventory and operating expenses. TOC’s set of tools examines the entire system for continuous improvement. The current reality tree, conflict resolution diagram, future reality tree, prerequisite tree and transition tree are the five tools used in TOC’s ongoing improvement process. Also called constraints management.

**3P:** The production preparation process is a tool for designing lean manufacturing environments. It is a highly disciplined, standardized model that results in the development of an improved production process in which low waste levels are achieved at low capital cost.

**Throughput:** The rate the system generates money through sales, or the conversion rate of inventory into shipped product.

**TL 9000:** A quality management standard for the telecommunications industry based on ISO 9000. Its purpose is to define the requirements for the design, development, production, delivery, installation and maintenance of products and services. Included are cost and performance-based measurements that measure reliability and quality performance of the products and services.

**Tolerance:** The maximum and minimum limit values a product can have and still meet customer requirements.

**Top management commitment:** Participation of the highest level officials in their organization’s quality improvement efforts. Their participation includes establishing and serving on a quality committee, establishing quality policies and goals, deploying those goals to lower levels of the organization, providing the resources and training lower levels need to achieve the goals, participating in quality improvement teams, reviewing progress organization wide, recognizing those who have performed well and revising the current reward system to reflect the importance of achieving the quality goals.

**Total productive maintenance (TPM):** A series of methods, originally pioneered by Nippondenso (a member of the Toyota group), to ensure every machine in a production process is always able to perform its required tasks so production is never interrupted.

**Total quality:** A strategic integrated system for achieving customer satisfaction that involves all managers and employees, and uses quantitative methods to continuously improve an organization’s processes.

**Total quality control (TQC):** A system that integrates quality development, maintenance and improvement of the parts of an organization. It helps an organization economically manufacture its product and deliver its services.

**Total quality management (TQM):** A term first used to describe a management approach to quality improvement. Since then, TQM has taken on many meanings. Simply put, it is a management approach to long-term success through customer satisfaction. TQM is based on all members of an organization participating in improving processes, products, services and the culture in which they work. The methods for implementing this approach are found in the teachings of such quality leaders as Philip B. Crosby, W. Edwards Deming, Armand V. Feigenbaum, Kaoru Ishikawa and Joseph M. Juran.

**Toyota production system (TPS):** The production system developed by Toyota Motor Corp. to provide best quality, lowest cost and shortest lead time through eliminating waste. TPS is based on two pillars: just-in-time and *jidohka* (see listings). TPS is maintained and improved through iterations of standardized work and *kaizen* (see listing.)

**Transaction data:** The finite data pertaining to a given event occurring in a process. Examples are the data obtained when an individual checks out groceries (the grocery shopping process) and the data obtained from testing a machined component (the final product inspection step of the production process).

**Tree diagram:** A management tool that depicts the hierarchy of tasks and subtasks needed to complete an objective. The finished diagram bears a resemblance to a tree.

**Trend:** The graphical representation of a variable’s tendency, over time, to increase, decrease or remain unchanged.

**Trend control chart:** A control chart in which the deviation of the subgroup average, X-bar, from an expected trend in the process level is used to evaluate the stability of a process.

**TRIZ:** A Russian acronym for a theory of innovative problem solving.

**T-test:** A method to assess whether the means of two groups are statistically different from each other.

**Type I error:** An incorrect decision to reject something (such as a statistical hypothesis or a lot of products) when it is acceptable.

**Type II error:** An incorrect decision to accept something when it is unacceptable.

U

**U chart:** Count-per-unit chart.

**Unit:** An object for which a measurement or observation can be made; commonly used in the sense of a “unit of product,” the entity of product inspected to determine whether it is defective or nondefective.

**Upper control limit (UCL):** Control limit for points above the central line in a control chart.

**Uptime:** See “equipment or system availability.”

V

**Validation:** The act of confirming a product or service meets the requirements for which it was intended.

**Validity:** The ability of a feedback instrument to measure what it was intended to measure; also, the degree to which inferences derived from measurements are meaningful.

**Value added:** A term used to describe activities that transform input into a customer (internal or external) usable output.

**Value analysis:** Analyzing the value stream to identify value added and nonvalue added activities.

**Value engineering:** Analyzing the components and process that create a product, with an emphasis on minimizing costs while maintaining standards required by the customer.

**Values:** The fundamental beliefs that drive organizational behavior and decision making.

**Value stream:** All activities, both value added and nonvalue added, required to bring a product from raw material state into the hands of the customer, bring a customer requirement from order to delivery and bring a design from concept to launch. Also see “information flow” and “*hoshin* planning.”

**Value stream loops:** Segments of a value stream with boundaries broken into loops to divide future state implementation into manageable pieces.

**Value stream manager:** A person responsible for creating a future state map and leading door-to-door implementation of the future state for a particular product family. Makes change happen across departmental and functional boundaries.

**Value stream mapping:** A pencil-and-paper tool used in two stages. First, follow a product’s production path from beginning to end and draw a visual representation of every process in the material and information flows. Second, draw a future state map of how value should flow. The most important map is the future state map.

**Variable data:** Measurement information. Control charts based on variable data include average (X-bar) chart, range (R) chart, and sample standard deviation (s) chart (see individual listings).

**Variation:** A change in data, characteristic or function caused by one of four factors: special causes, common causes, tampering or structural variation (see individual entries).

**Verification:** The act of determining whether products and services conform to specific requirements.

**Virtual team:** Remotely situated individuals affiliated with a common organization, purpose or project, who conduct their joint effort via electronic communication.

**Vision:** An overarching statement of the way an organization wants to be; an ideal state of being at a future point.

**Visual controls:** Any devices that help operators quickly and accurately gauge production status at a glance. Progress indicators and problem indicators help assemblers see when production is ahead, behind or on schedule. They allow everyone to instantly see the group’s performance and increase the sense of ownership in the area. Also see “andon board,” “*kanban*,” “production board,” “painted floor” and “shadow board.”

**Vital few, useful many:** A term Joseph M. Juran used to describe the Pareto principle, which he first defined in 1950. (The principle was used much earlier in economics and inventory control methods.) The principle suggests most effects come from relatively few causes; that is, 80% of the effects come from 20% of the possible causes. The 20% of the possible causes are referred to as the “vital few;” the remaining causes are referred to as the “useful many.” When Juran first defined this principle, he referred to the remaining causes as the “trivial many,” but realizing that no problems are trivial in quality assurance, he changed it to “useful many.” Also see “eighty-twenty (80-20).”

**Voice of the customer:** The expressed requirements and expectations of customers relative to products or services, as documented and disseminated to the providing organization’s members.

**Voluntary standard:** A standard that imposes no inherent obligation regarding its use.

W

**Waste:** Any activity that consumes resources and produces no added value to the product or service a customer receives. Also known as *muda*.

**Weighed voting:** A way to prioritize a list of issues, ideas or attributes by assigning points to each item based on its relative importance.

**Wilcoxon Mann-Whitney test:** Used to test the null hypothesis that two populations have identical distribution functions against the alternative hypothesis that the two distribution functions differ only with respect to location (median), if at all. It does not require the assumption that the differences between the two samples are normally distributed. In many applications, it is used in place of the two-sample t-test when the normality assumption is questionable. This test can also be applied when the observations in a sample of data are ranks, that is, ordinal data rather than direct measurements.

**Working sequence:** One of three elements of standard work; refers to the sequence of operations in a single process that leads a floor worker to most efficiently produce quality goods.

**Work in process:** Items between machines or equipment waiting to be processed.

**Work team:** See “natural team.”

**World-class quality:** A term used to indicate a standard of excellence: best of the best.

X

**X-bar chart:** Average chart.

Y

**Yellow Belt:** A team member who supports and contributes to Six Sigma projects, often helping to collect data, brainstorm ideas and review process improvements.

Z

**Zero defects:** A performance standard and method Philip B. Crosby developed; states that if people commit themselves to watching details and avoiding errors, they can move closer to the goal of zero defects.

**NEW! Z1.4 and Z1.9:** *ANSI/ASQ Z1.4-2003 (R2013): Sampling Procedures and Tables for Inspection by Attributes* is an acceptance sampling system to be used with switching rules on a continuing stream of lots for the acceptance quality limit (AQL) specified. *ANSI/ASQ Z1.9-2003 (R2013): Sampling Procedures and Tables for Inspection by Variables for Percent Nonconforming* is an acceptance sampling system to be used on a continuing stream of lots for the AQL specified.