**Kaizen (continuous improvement)**

Kaizen is an approach to creating continuous improvement based on the idea that small, ongoing positive changes can accumulate and aggregate into significant improvements. Typically, it is based on cooperation and commitment and stands in contrast to approaches that use radical or top-down changes to achieve transformation. Kaizen is core to lean manufacturing and the Toyota Way. It was developed in the manufacturing sector to lower defects, eliminate waste, boost productivity, encourage worker purpose and accountability and promote innovation.

As a broad concept that carries myriad interpretations, it has been adopted in many other industries, including healthcare. It can be applied to any area of business and even on the individual level. Kaizen can use a number of approaches and tools, such as value stream mapping -- which documents, analyzes and improves information or material flows required to produce a product or service -- and Total Quality Management -- which is a management framework that enlists workers at all levels to focus on quality improvements. Regardless of methodology, in an organizational setting, the successful use of Kaizen rests on gaining support for the approach across the organization and from the CEO down.

Kaizen is a compound of two Japanese words that together translate as "good change" or "improvement." However, Kaizen has come to mean "continuous improvement" through its association with lean methodology and principles.

Kaizen has its origins in post-World War II Japanese quality circles. These circles or groups of workers focused on preventing defects at Toyota. They were developed partly in response to American management and productivity consultants who visited the country, especially W. Edwards Deming, who argued that quality control should be put more directly in the hands of line workers. Kaizen was brought to the West and popularized by Masaaki Imai via his book Kaizen: The Key to Japan's Competitive Success in 1986.

10 principles of Kaizen

Because executing Kaizen requires enabling the right mindset throughout a company, 10 principles that address the Kaizen mindset are commonly referenced as core to the philosophy. They are:

Let go of assumptions.

Be proactive about solving problems.

Don't accept the status quo.

Let go of perfectionism and take an attitude of iterative, adaptive change.

Look for solutions as you find mistakes.

Create an environment in which everyone feels empowered to contribute.

Don't accept the obvious issue; instead, ask "why" five times to get to the root cause.

Cull information and opinions from multiple people.

Use creativity to find low-cost, small improvements.

Never stop improving.

How Kaizen works

Kaizen is based on the belief that everything can be improved, and nothing is the status quo. It also rests on a Respect for People principle. Kaizen involves identifying issues and opportunities, creating solutions and rolling them out -- and then cycling through the process again for inadequately addressed issues and problems. A cycle made up of seven steps can be implemented for continuous improvement and can provide a systematic method for executing this process.

Kaizen includes seven steps, from identifying problems to finding solutions, testing them out, analyzing the results and then doing it all again.

Kaizen cycle for continuous improvement

Kaizen can be implemented in a seven-step cycle to create an environment based on continuous improvement. This systematic method includes the following steps:

Get employees involved. Seek the involvement of employees, including soliciting their help in identifying issues and problems. Doing so creates buy-in for change. Often, this is organized as specific groups of individuals charged with gathering and relaying information from a wider group of employees.

Find problems. Using widespread feedback from all employees, gather a list of problems and potential opportunities. Create a list if there are many issues.

Create a solution. Encourage employees to offer creative solutions, with all manner of ideas encouraged. Pick a winning solution or solutions from the ideas presented.

Test the solution. Implement the winning solution chosen above, with everyone participating in the rollout. Create pilot programs or take other small steps to test out the solution.

Analyze the results. At various intervals, check progress, with specific plans for who will be the point of contact and how best to keep ground-level workers engaged. Determine how successful the change has been.

If results are positive, adopt the solution throughout the organization.

These seven steps should be repeated on an ongoing basis, with new solutions tested where appropriate or new lists of problems tackled.

Additional approaches to the Kaizen cycle exist, such as one that is condensed into four steps -- plan, do, check, act, or PDCA. It is also known as the Shewhart cycle or Deming cycle.

Types of Kaizen events

Although the aim of Kaizen is widespread cultural change, the events to kick-start the efforts involved or focus on a specific set of problems have evolved.

In the West, these concentrated efforts to make quick changes to achieve a short-term goal are often the extent of Kaizen efforts. There are numerous names associated with Kaizen events, including Kaizen blitz, Kaizen burst, Kaizen workshop, focused improvement workshop, continuous improvement workshop and rapid process workshop. These events can rely on various tools or focus on specific areas, such as the 5S framework, total productive maintenance and value stream mapping.

Kaizen 5S framework

A 5S framework is a critical part of the Kaizen system and establishes an ideal physical workplace. The 5Ses focus on creating visual order, organization, cleanliness and standardization to improve profitability, efficiency, service and safety. Below are the original Japanese 5Ses and their common English translations.

Seiri/Sort (organize). Separate necessary workplace items from unnecessary ones and remove unnecessary items.

Seiton/Set in order (create orderliness). Arrange items to allow for easy access in the way that makes the most sense for work.

Seiso/Shine (cleanliness). Keep the workspace clean and tidy.

Seiketsu/Standardize (standardized cleaning). Systematize workplace cleanup best practices.

Shitsuke/Sustain (discipline). Keep the effort going.

Advantages and disadvantages of Kaizen

There are several reasons why Kaizen can be an advantage for an organization; however, there are some situations for which it is less suited. Some of Kaizen's advantages and disadvantages include the following:

Kaizen advantages

Kaizen's focus on gradual improvement can create a gentler approach to change in contrast to big efforts that may be abandoned due to their tendency to provoke change resistance and pushback.

Kaizen encourages scrutiny of processes so that mistakes and waste are reduced.

With fewer errors, oversight and inspection needs are minimized.

Employee morale improves because Kaizen encourages a sense of value and purpose.

Teamwork increases as employees think beyond the specific issues of their department.

Client focus expands as employees become more aware of customer requirements.

Systems are in place to ensure improvements are encouraged both in the short and long terms.

Kaizen disadvantages

Companies with cultures of territorialism and closed communication may first need to focus on cultural changes to create a receptive environment.

Short-term Kaizen events may create a burst of excitement that is shallow and short-lived and, therefore, is not sustained.

Examples of Kaizen

Toyota is arguably the most famous for its use of Kaizen, but other companies have successfully used the approach. Here are three examples:

Lockheed Martin. The aerospace company is a well-known proponent of Kaizen. It has used the method to successfully reduce manufacturing costs, inventory and delivery time.

Ford Motor Company. When lean devotee Alan Mulally became CEO of Ford in 2006, the automaker was on the brink of bankruptcy. Mulally used Kaizen to execute one of the most famous corporate turnarounds in history.

Pixar Animation Studios. Pixar applied the continuous improvement model to reduce the risks of expensive movie failure by using quality control checks and iterative processes.

**Lean Manufacturing**

Lean manufacturing is a methodology that focuses on minimizing waste within manufacturing systems while simultaneously maximizing productivity. Waste is seen as anything that customers do not believe adds value and are not willing to pay for. Some of the benefits of lean manufacturing can include reduced lead times, reduced operating costs and improved product quality.

Lean manufacturing, also known as lean production, or lean, is a practice that organizations from numerous fields can enable. Some well-known companies that use lean include Toyota, Intel, John Deere and Nike. The approach is based on the Toyota Production System and is still used by that company, as well as myriad others. Companies that use enterprise resource planning (ERP) can also benefit from using a lean production system.

Lean manufacturing is based on a number of specific principles, such as Kaizen, or continuous improvement.

Lean manufacturing was introduced to the Western world via the 1990 publication of The Machine That Changed the World, which was based on an MIT study into the future of the automobile detailed by Toyota's lean production system. Since that time, lean principles have profoundly influenced manufacturing concepts throughout the world, as well as industries outside of manufacturing, including healthcare, software development and service industries.

5 principles of lean manufacturing
A widely referenced book, Lean Thinking: Banish Waste and Create Wealth in Your Corporation, which was published in 1996, laid out five principles of lean, which many in the field reference as core principles. They are value, the value stream, flow, pull and perfection. These are now used as the basis for lean implementation.

1. Identify value from the customer's perspective. Value is created by the producer, but it is defined by the customer. Companies need to understand the value the customer places on their products and services, which, in turn, can help them determine how much money the customer is willing to pay.

The company must strive to eliminate waste and cost from its business processes so that the customer's optimal price can be achieved -- at the highest profit to the company.

2. Map the value stream. This principle involves recording and analyzing the flow of information or materials required to produce a specific product or service with the intent of identifying waste and methods of improvement. Value stream mapping encompasses the product's entire lifecycle, from raw materials through to disposal.

Companies must examine each stage of the cycle for waste. Anything that does not add value must be eliminated. Lean thinking recommends supply chain alignment as part of this effort.

3. Create flow. Eliminate functional barriers and identify ways to improve lead time. This aids in ensuring the processes are smooth from the time an order is received through to delivery. Flow is critical to the elimination of waste. Lean manufacturing relies on preventing interruptions in the production process and enabling a harmonized and integrated set of processes in which activities move in a constant stream.

4. Establish a pull system. This means you only start new work when there is demand for it. Lean manufacturing uses a pull system instead of a push system.

Push systems are used in manufacturing resource planning (MRP) systems. With a push system, inventory needs are determined in advance, and the product is manufactured to meet that forecast. However, forecasts are typically inaccurate, which can result in swings between too much inventory and not enough, as well as subsequent disrupted schedules and poor customer service.

In contrast to MRP, lean manufacturing is based on a pull system in which nothing is bought or made until there is demand. Pull relies on flexibility and communication.

5. Pursue perfection with continual process improvement, or Kaizen. Lean manufacturing rests on the concept of continually striving for perfection, which entails targeting the root causes of quality issues and ferreting out and eliminating waste across the value stream.

The 8 wastes of lean production
The Toyota Production System laid out seven wastes, or processes and resources, that don't add value for the customer. These seven wastes are:

unnecessary transportation;
excess inventory;
unnecessary motion of people, equipment or machinery;
waiting, whether it is people waiting or idle equipment;
over-production of a product;
over-processing or putting more time into a product than a customer needs, such as designs that require high-tech machinery for unnecessary features; and
defects, which require effort and cost for corrections.
Although not originally included in the Toyota Production System, many lean practitioners point to an eighth waste: waste of unused talent and ingenuity.

7 lean manufacturing tools and concepts
Lean manufacturing requires a relentless pursuit of reducing anything that does not add value to a product, meaning waste. This makes continuous improvement, which lies at the heart of lean manufacturing, a must.

Other important concepts and processes lean relies on include:

Heijunka: production leveling or smoothing that seeks to produce a continuous flow of production, releasing work to the plant at the required rate and avoiding interruptions.
5S: A set of practices for organizing workspaces to create efficient, effective and safe areas for workers and which prevent wasted effort and time. 5S emphasizes organization and cleanliness.
Kanban: a signal used to streamline processes and create just-in-time delivery. Signals can either be physical, such as a tag or empty bin, or electronically sent through a system.
Jidoka: A method that defines an outline for detecting an abnormality, stopping work until it can be corrected, solving the problem, then investigating the root cause.
Andon: A visual aid, such as a flashing light, that alerts workers to a problem.
Poka-yoke: A mechanism that safeguards against human error, such as an indicator light that turns on if a necessary step was missed, a sign given when a bolt was tightened the correct number of times or a system that blocks a next step until all the previous steps are completed.
Cycle time: How long it takes to produce a part or complete a process.

Lean vs. Six Sigma
Six Sigma is an approach to data-driven management, similar in nature to lean, which seeks to improve quality by measuring how many defects there are in a process and eliminating them until there are as little defects as possible.

Both lean and Six Sigma seek to eliminate waste. However, the two use different approaches since they address the root cause of waste differently.

learn how lean production and six sigma work together
In the simplest terms, where lean holds that waste is caused by additional steps, processes and features that a customer doesn't believe adds value and won't pay for, Six Sigma holds that waste results from process variation. Still, the two approaches are complementary and have been combined into a data-driven approach, called Lean Six Sigma.

**Lean Six Sigma**

Lean Six Sigma is the fusion of two popular business principles -- lean and Six Sigma -- into one methodology, to improve organizational performance and eliminate waste processes. It combines Toyota's lean manufacturing philosophy with the qualitative and quantitative techniques for driving process improvement that Motorola's Six Sigma management strategy provides.

Lean Six Sigma recognizes the role that stakeholders play in every project's success, as well as the importance of gathering and analyzing data to help those stakeholders understand the effectiveness -- or ineffectiveness -- of the workflow. It is a pragmatic approach that enables an organization to pick which parts of each discipline will help it meet its goals.

Six Sigma vs. Lean Six Sigma: What's the difference?
To understand the flexibility that Lean Six Sigma provides, it is important to be aware of the similarities and differences between the two disciplines.

Both lean management and Six Sigma seek to eliminate waste and improve business processes. An important difference, however, is that lean management relies on people to identify what problems are causing waste. The philosophy of lean management is to do more with less, and it is built around two important principles -- Kaizen continuous improvement and respect for people.

Lean Six Sigma process
Lean Six Sigma combines the best of both Six Sigma and the lean manufacturing process.
All employees are expected to help eliminate waste; they receive just-in-time (JIT) training regularly, and the tools they are given to identify and eliminate waste are designed to be easily understood and implemented. Lean management tools for process improvement include the following:

The 5 Whys. A problem-solving technique, the concept of 5 Whys was popularized by Toyota in the 1950s. It is based on this simple belief: Whenever a problem arises, ask the question "why?" at least five times or more, until a solution is found. This helps organizations perform root cause analysis and troubleshoot by answering each subsequent "why" until the eventual solution is revealed.
Kanban inventory control cues. A Japanese term that means visual card, kanban is a visual system used to manage and keep track of work as it flows through a process. Kanban can be done in many variations, but generally a series of cards are used on a visual board such as a heijunka box, to provide an overview of the amount of work and the total number of tasks that need to be performed. The board is generally divided into three areas -- waiting for production, in production and produced.
Heijunka box. A wall-size visual scheduling tool, a heijunka box is used for achieving a seamless production flow. Typically, heijunka is a wall-mounted grid of small boxes, or pigeonholes. The row of boxes represents a process, whereas each column signifies a time period.
Ishikawa fishbone diagrams. A fishbone diagram is a cause-and-effect visualization tool that helps track down the reasons behind problems and defects. It combines the practice of brainstorming with a type of mind map template to determine the root cause of a problem.
Takt time calculations. This calculation is used to identify the maximum acceptable time to meet the demands of the customers. To come up with the maximum acceptable time, the takt time formula divides the net time available for production by the customer's daily demand.
Value stream mapping. Value stream mapping uses a flowchart to document every step required for a process. By providing a structured visualization and analysis of the key steps, value stream mapping improves the flow of information and materials required for building products and services for customers.

Six Sigma, on the other hand, relies on data to identify problems in a business process. The management philosophy was named after the Greek letter sigma, which is used in statistics to denote variation from a standard.

For a company to achieve Six Sigma, it cannot produce more than 3.4 defects per one million opportunities for nonconformance. Six Sigma is designed to be used by a select number of employees who have been chosen to receive formal training in progressive levels of study.

Six Sigma project management tools include statistical analysis, stochastic optimization and engineering process control. Management strategies include DMAIC (define, measure, analyze, improve, control) and DMADV (define, measure, analyze, design, verify), both of which are based on American engineer and statistician, W. Edwards Deming's plan-do-check-act cycle.

Types of waste defined by Lean Six Sigma
The tenets of Lean Six Sigma classify any resource that does not add value to customers as waste that should be discarded. There are eight types of waste defined by Lean Six Sigma and the acronym DOWNTIME is commonly used for easy recall. Each letter in this acronym stands for the following:

Defects. A defective product that is not meeting the quality standards.
Overproduction. Excessive production that surpasses the demand.
Waiting. Bottlenecks and unplanned downtimes.
Non-utilized talent. Underutilizing and improper allocation of employee talents and skill sets.
Transportation. Poorly managed shipping and transportation methods.
Inventory. A surplus of supply that exceeds customer demands.
Motion. Excess movement of products, machines or people.
Extra processing. The creation of repetitive tasks and doing more than what is required.
Lean Six Sigma in manufacturing
As mentioned above, the Lean Six Sigma methodology is the combination of the lean manufacturing ideology popularized by Toyota and Motorola's Six Sigma strategy. This combination makes Lean Six Sigma an effective tool to optimize business processes and customer relations and, in turn, improve profits.

Shortly after World War II, Toyota's manufacturing process prioritized minimizing bloat and maximizing flexibility. Inspired by Toyota's ideology, a Motorola engineer in the 1980s invented the Six Sigma management strategy.

Where lean manufacturing emphasizes streamlining processes, Six Sigma focuses on eliminating defects in these processes. Six Sigma teams achieve this by minimizing variation in the processes.

Lean Six Sigma is often associated with the Xerox Corp. In the early part of this century, the company implemented Lean Six Sigma to improve customer experience and to become more cost-competitive. Since then, Xerox has promoted how it has successfully combined the infrastructure of Six Sigma with the philosophy of continuous improvement from lean manufacturing to streamline the company's internal processes and provide customers with quality products and services at speeds and prices that customers value. One of those services happens to be helping Xerox customers use Lean Six Sigma to improve their own business processes.

Lean Six Sigma levels, certificates and training
An individual can attain Lean Six Sigma certification at varying levels based on their training. Testing and training for the Lean Six Sigma certification is conducted by the globally recognized International Association for Six Sigma Certification (IASSC). The certification levels are divided into the following belts, similar to the levels used in martial arts training:

White Belt. This first level of Lean Six Sigma certification aims to provide trainees with a fundamental understanding of Lean Six Sigma methodology, including but not limited to process improvement, variability, eliminating negative effects on process performance and deciding what roles specific team members should play.

Yellow Belt. This belt builds off of the White Belt certification course and aims to give trainees a more detailed and comprehensive understanding of Lean Six Sigma methodologies.

Green Belt. The Lean Six Sigma Green Belt focuses on the application of the methodologies outlined in the White and Yellow Belt courses. In Green Belt certification courses, trainees learn to chart and plan the roles of individuals within Lean Six Sigma teams, in addition to learning how to run statistical tools tests that are used to improve processes.

Black Belt. This belt certifies the trainees as experts in the principles and philosophies of Lean Six Sigma. They are known to be agents of change who provide training and thought leadership for complicated team projects. Lean Six Sigma Black Belts also train and coach the Green Belt project leaders.

Master Black Belt (MBB). The final belt that is given out in the Lean Six Sigma certification process teaches trainees to explain multiple regression, perform factorial experiments, determine size calculations for experiments and describe different types of process optimization. In short, the MBB is the pinnacle of Lean Six Sigma training. According to IASSC, the Master Black Belt certification exam is a closed book, proctored exam with 150 questions and takes about four hours to complete.

Lean Six Sigma belts
These five belts signify various levels of Lean Six Sigma certification.
Benefits of Lean Six Sigma methodology
The Lean Six Sigma methodology offers huge transformation opportunities across all industries. By adding the Lean Six Sigma principles into their daily workflows, employees, businesses and customers can reap the following benefits:

Benefits for employees. Lean Six Sigma promotes high levels of employee engagement during process improvements. This boosts team spirit and accelerates development and organizational performance. Employees not only gain a better understanding of the effect their work has on business success, but they also develop a deeper appreciation for the work of other employees and departments.
Benefits for business. Reduced cost is the most desirable benefit that businesses gain by engaging in Lean Six Sigma principles. The efficient process flows, reduction of wasted resources, decreased lead times and standardization of processes all lead to higher bottom-line results.
Benefits for customers. Lean Six Sigma requires a strong focus on customer satisfaction and delivering high-quality results. This, coupled with the streamlined processes offered by Lean Six Sigma, help improve customer experience and retention rates. Customers enjoy product improvements and enhanced product delivery methods which, in turn, elevates customer satisfaction.
History and examples of Lean Six Sigma
Inspired by Japan's Kaizen model, a Motorola engineer introduced the Lean Six Sigma principles in 1986. Any organization, regardless of its size or industry affiliation, can benefit from the Lean Six Sigma model.

Following are examples of how Lean Six Sigma is used to remove various obstacles:

Manufacturing defects. Lean Six Sigma can prevent manufacturing defects. For example, natural gas must be dehydrated to prevent oversaturation and corrosion from the water vapors. By using Lean Six Sigma, companies can address these defects during the manufacturing process of natural gas dehydrators.

Repairs. Lean Six Sigma can reduce the number of repairs during construction projects. For example, in the construction and connection of pipeline sections, welded connections can deteriorate, causing connection failures. By implementing Lean Six Sigma training, welders can learn how to avoid connection defects, which can reduce the number of weld repairs in pipeline construction projects.

IT downtime. Unplanned IT system downtimes can have adverse effects on companies. By using the Lean Six Sigma principles, companies can avoid and prevent unnecessary downtime.

Billing problems. By applying the Lean Six Sigma principles, home healthcare organizations can reduce billing denials and rejections related to Medicare.

IT security threats. Lean Six Sigma can mitigate security threats. For example, pipeline infrastructure is a combination of thousands of companies and miles of pipelines responsible for the transportation of oil, natural gas and other precious commodities. By incorporating Lean Six Sigma, companies can reduce the risk of cyber and IT security threats in pipeline control systems.

Payroll processing errors. Payroll processing errors are a common occurrence for many organizations. By applying Lean Six Sigma principles, payroll processing errors can be eliminated for biweekly employees.

Environmental impact. Companies practicing Lean Six Sigma can have a positive effect on the environment. For example, Lean Six Sigma principles can guide biochemical industries to reduce the hazardous impact of batch chemical processes on the environment.

Lean manufacturing is quickly becoming the industry standard for streamlined processes and waste reduction. Understand the lean manufacturing methodology and the tools and concepts that make it happen.

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Toyota and Total Productive Maintenance

[David McBride](https://www.reliableplant.com/Authors/Detail/495)
Tags: [lean manufacturing](https://www.reliableplant.com/Meta/Tags/lean%20manufacturing)

One of the most recognizable symbols in modern manufacturing is the “TPS House” diagram as shown below. The diagram is a simple representation of the Toyota Production System (TPS) that Toyota developed to teach their supply base the principles of the TPS. The foundation of the house represents operational stability and has several components, one of which is Total Productive Maintenance.

 

Working with little inventory and stopping production when there is a problem causes instability and a sense of urgency among workers. In mass production, when a machine goes down, there is no sense of urgency; excess inventory will keep the operation running while maintenance fixes the problem.

In lean production, when an operator shuts down production to fix a problem, the line will soon stop producing, creating a crisis and a sense of urgency. A properly implemented and maintained [Total Productive Maintenance System](https://www.reliableplant.com/Read/26210/tpm-lean-implement) (TPM) will provide the needed stability for lean production.

A little more than 30 years ago, an automotive supplier company in Japan (Nippondenso) realized that until you address and systematically eliminate the causes of poor equipment performance, you cannot deliver to your customers “just in time,” improve quality levels, lower operating costs or improve profits.

In 1969, the ideas of Total Productive Maintenance, facilitated by Seiichi Nakajima, helped take the Toyota Production System to the next level. Since the Toyota Production System was focused on the absolute elimination of waste to reduce manufacturing cost, TPM was designed to systematically identify and eliminate equipment losses ([downtime](https://www.reliableplant.com/Read/30885/track-equipment-downtime), inefficiency, defects).

In implementing [lean manufacturing](https://www.reliableplant.com/Read/30267/lean-manufacturing-techniques) practices, [machine availability](https://www.reliableplant.com/Read/19702/improving-availability-is-much-more-than-maintenance) plays an important role. Preventive maintenance is a key aspect in ensuring machine availability. This practice achieves maximum efficient usage of machines through total employee involvement.

Toyota has created an organizational culture that encourages employee participation, which is essential for successful TPM. Group activities are promoted among the shop-floor team members. The knowledge base of all the employees is used to improve [equipment reliability](https://www.reliableplant.com/Read/415/reliability-asset-management) and productivity thereby lowering maintenance and operating costs.

Two other important aspects of TPM are training and open communication between operators and engineering. Production personnel are trained to perform routine maintenance.

The traditional approach to preventive maintenance is a clear-cut division of labor.

* Machine operators perform routine maintenance functions.
* Maintenance technicians are responsible for specialized maintenance and for [improving maintainability](https://www.reliableplant.com/Read/28939/attain-reliability-maintainability).
* Engineering is responsible for improving the process.

This practice is not capable of achieving the TPM targets, as there is a lack of communication between operating and maintenance teams.

Nippondenso came out with an alternative approach of appointing a machine technician (MT) that supports communication between operators and maintenance. The responsibilities of the MT were to perform minor maintenance and repair tasks. These MTs underwent classroom training on tool finishing and fitting as well as on-the-job training. On-the-job training gave them exposure to machines and helped them gain expertise in their area.

There are two different types of philosophies of TPM. Firstly, there is the centralized maintenance approach. This requires maintenance personnel to be cross-trained, thus providing flexibility of using a number of workers for [scheduling maintenance tasks](https://www.reliableplant.com/Read/30261/maintenance-planning-scheduling). This flexibility is essential because as workers move up in seniority level, there is a tendency to opt for convenient shifts instead of third shift.

The second approach is decentralization. As personnel become more experienced in one functional area, they gain more expertise. Sometimes it requires six months of training before a person becomes proficient in a new area. Thus, frequent job rotations may result in under-utilization of skills gained through training.

A good example of this type of approach is at Honda Motors for its three departments – suspension assembly, facilities and engine assembly. Each department has a separate maintenance team. The reasons for this shift were the need for 12 to 18 months of training in each area, and local regulations required maintenance to take place only on weekends and shutdowns.

Toyota has a centralized maintenance function with cross-trained employees. The benefits of decentralized maintenance are derived from the use of MTs. These MT’s are experts in their areas. However, availability of limited maintenance personnel necessitates cross-trained employees.

Toyota also collects data for analysis and trend establishment. Sufficient data on the trend and pattern of equipment’s performance should be available for identifying and setting up standards and procedures for preventive maintenance. This data would also be useful in determining costs of preventive maintenance and repairs, run-to-failure vs. preventive maintenance, and failure history.

Organizations also need to evaluate the impact of organizational structure and processes on preventive maintenance. Change in these can have an overwhelming impact on employee morale, efficiency and effectiveness. As Toyota has shown, preventive [maintenance management](https://www.reliableplant.com/Read/634/maintenance-management-legends) calls for long-term commitment to the goal and pays dividends in the long run.