Lean Manufacturing
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For many years, “lean” has been a hot topic among automotive manufacturers. It is well known in the industry as the method Toyota has used successfully to streamline operations, reduce cost, and optimize the quality of its products. You may have heard claims about what lean can do based on the results of Toyota and other manufacturers and question how many of these claims are true. As an original equipment manufacturer (OEM) for the automotive industry, you know the complexity of your product flow and how dependent your customer is on timely and accurate deliveries. Can lean be applied to the specific needs and challenges of your manufacturing process?

To begin to answer these questions, it is important to first address another one.

Why Do You Want to Go Lean?

Let's say you are an automotive OEM, and you are delivering high-quality products to your customer. However, you notice that the quality of your parts has begun to slip while your costs have increased. You take a closer look at your manufacturing process and see the following problems:

- The time it takes to set up and change over to a new product line has been increasing.
- Some work centers are overburdened while others are underutilized, resulting in capacity bottlenecks and poor workflow.
- Unscheduled downtime has been increasing, resulting in disrupted delivery schedules.
- More material and capacity shortages have resulted in missed deliveries. When the product is again available, it must be expedited to the customer at a higher cost.
- Overly complex scheduling system has slowed the manufacturing process and resulted in too much paperwork.
- The number of customer returns has been increasing due to quality issues.

These are common manufacturing problems, and the usual response has been to find the manufacturing phase or process that is causing the problem and fix it. But what if the problem isn't caused by a single phase, but the way the phases work together? For example, the shipping warehouse has the capacity to receive 2,000 parts per hour, but the factory floor can produce only 1,000 on a particular day because of material shortages earlier in the process. Because of this, forklift drivers sit idle because the scheduling system is not flexible enough to reassign them to another task during that time.

Even if the product flow is acceptable, the manufacturing process may not be able to cope with quickly changing customer demand. Maybe you have been supplying your customer with green parts, and in the middle of your 80-hour production cycle, the customer asks for red parts. You're on a 15-minute delivery schedule … what do you do? There is no room for error here—if you can't supply your customers with exactly what they need, there are plenty of other OEMs they can go to.

Your manufacturing problems are better handled by taking into account the flow of product through the entire process, rather than focusing on a single phase of production. Fixing the problems involves smoothing the flow and making the process more agile. This focus on product flow and process agility is fundamental to lean—which leads us to the next question.
What Is Lean?

One of the difficulties in answering this question is that there are many interpretations of what lean is. It is reasonable to expect that a management concept as popular as lean would have one concise and agreed-upon definition, but the reality is that many exist. Let's begin with a look into the aspects of lean philosophy that are generally agreed upon.

Lean is not a new idea. Even though the term “lean” has existed since the early seventies, the techniques can be traced much farther back to ideas developed by Frederick W. Taylor, often called “The Father of Scientific Management.” In 1911, he published his methods of applying scientific analysis and testing to manufacturing in a book called The Principles of Scientific Management. Japanese companies used the concepts in this book to rebuild their businesses after World War II. Among these companies, Toyota became particularly noted for its success in applying the techniques, refining them in its automotive manufacturing process and renaming them the Toyota Production System (TPS). Businesses around the world began to adopt these practices in hopes of achieving the same results, and TPS became the model for what would eventually be called lean manufacturing.

Lean has been described as a manufacturing process, but it is much more than that. It encompasses all aspects of business, including payments processing and project management as well as manufacturing. When a business operates according to lean principles, all departments within a company work together to achieve two objectives:

• Increase the value of the product to the customer
• Reduce waste

In this context, your customer is the automotive manufacturer that receives your finished parts. Waste refers to any expenditure of company resources—not limited to manufacturing—that does not directly result in adding value to the part or maintaining its value.

Other non-lean manufacturing techniques such as Total Quality Management share these objectives. However, they start with the question “What provides the company with the most value at the least cost?” while lean begins with the question “What provides the customer with the most value at the least cost?” This change in the focus to the customer's perspective is important. The value of the product to the manufacturer is that the product is produced at the lowest possible cost, and the value of the product to the customer is that it be useful for as long as possible. Because the customer has the longer-term investment in the product, it will have the higher standard of value. The assumption in lean is that when the company adopts the customer's standard of value it will try harder and work better to increase product value and reduce waste than it would otherwise. In lean philosophy, the definition of “waste” becomes more specific and customer-oriented: “What would customers not be willing to pay for in the total cost of making the product?” The answer is, “Anything beyond that which directly results in them getting the part they need.”

Another reason that lean emphasizes customer value is that the effort to reduce the cost of one manufacturing stage may increase it in another. The design process is the most costly step of manufacturing, and an engineer may decide to significantly reduce design time by specifying more expensive materials simply because he or she is more familiar with them. This will reduce the costs of design but increase the overall cost of producing the product. The customer-oriented perspective makes the cost analysis much easier—if the overall cost at the end of the manufacturing process is reduced and
quality is maintained, corporate profit will be increased by lowering the cost of manufacturing and eventually selling more product.

Interpretations of *lean philosophy* do exist where the main concern is to maximize corporate profit by reducing the cost of manufacturing. Even in these interpretations, it is assumed that the best way to maximize corporate profit over the long run is to maximize value for the customer.

In the *lean* world, there are six kinds of waste in the manufacturing process:

- **Defects.** When a defective part is shipped to the customer, the customer must waste time and labor identifying the defect and returning the defective part to the OEM. The OEM's time and labor have been wasted in manufacturing the part.
- **Transport.** The parts the OEM ships to the customer should *only* be what the customer needs and should be undamaged at the time of delivery. When these conditions have not been met, time and labor have been wasted for the OEM and the customer.
- **Timing.** When the parts are shipped to the customer before the customer is ready to receive them, time, labor, and other resources are wasted in storing the parts until they are needed. Also, when the customer is ready to receive the part, the specifications for the part may have changed. Again, in this case, the OEM's time and labor have been wasted.
- **Waiting.** This is the opposite of overproduction. When the customer must wait for a parts shipment, the customer must divert manufacturing resources to other processes and the OEM’s time and labor are wasted.
- **Overproduction.** When an OEM produces more parts than the customer wants or parts with features that the customer does not need, the OEM's time and labor are wasted.
- **Motion.** To save time, the amount of effort for a worker to perform a task must be minimized. For example, effort is wasted when there is too much distance between workstations, and a line worker must spend more time carrying a part between them.

**How Do You Apply Lean to Your Manufacturing Process?**

*Lean* has a clearly defined set of principles to guide you in applying it to your manufacturing process:

- Precisely determine the *customer-defined value* of the product.
- Identify the product’s *value stream*.
- Ensure that the value flows uninterrupted through the manufacturing process.
- Establish the process so that the customer “pulls” the value from the producer.
- Continuously attempt to perfect the first four principles.

Let’s look at each of these principles in more detail.

**Determining the Customer-Defined Value**

When all aspects of the manufacturing process meet the customer’s needs at a specific price and time, the *customer-defined value* is met. When the customer doesn't respond to a product by ordering more, the OEM often makes the mistake of adding more bells and whistles to the product or adjusting the price. If that doesn't work, the OEM employs another marketing strategy even when it is clear that the
customer has already decided against the product. In this case, the producer is focused on fixing the internal process and not on rethinking the product value from the perspective of the customer. Lean thinking clears the board, ignoring existing assets and technologies, and rebuilds the process into one that ensures product flow and no waste.

**Identifying and Analyzing the Value Stream**

The value stream includes all the steps and processes necessary to put the raw materials together to create the finished product and deliver it to the customer. Implementing lean involves analyzing the value stream, which identifies three types of actions throughout the stream: actions that create value; actions that do not create value but are unavoidable because of the restrictions of current technologies, production methods, and assets; and actions that create no value and are avoidable. These actions are individually assessed, and those that do not directly create customer value are either redesigned so that they do create value or are removed from the process.

**Making the Process Flow**

When the customer value has been precisely determined, and the value stream has been analyzed and optimized, all of the actions in the process must be made to flow efficiently. Doing this requires a change of perspective from one that groups tasks by type to one that focuses on how the product should meet customers’ needs. The tendency is to think that grouping similar tasks will keep everyone busy and will automatically guarantee that the process flow will be efficient, but this isn't true. On the contrary, this often makes the process rigid and not adaptable to changing requirements. The product flow is disrupted, and time is lost while the product waits for the next operation, or workers change over to another activity.

The workcell, a key lean concept, results in optimal workflow. The workcell is a space on the factory floor where all of the work necessary to complete the assembly of one part is done.

Workers don't have to cross long distances to access all of the machines they need to produce a part; the machines are always near them and arranged in such a way as to minimize movement. Production lines are usually organized into groups of workcells.

*Lean* asserts that the effort of everyone in the product flow must result in adding customer value to the product and nothing else; this can only be done by minimizing worker effort and maximizing productivity, and only then can the process be implemented with the agility that ensures that it can
quickly meet changing requirements with no waste.

*Establishing Customer “Pull” Through the Process*

The way to incorporate agility into the process so that customers always get what they want is to make it possible for the customers to continuously communicate their needs to each part of the manufacturing process. In effect, the customer is “pulling” the product through the process. *Lean manufacturing* methods make use of the *kanban* system to do this—a system in which signals (usually in the form of cards) containing updated information about customer needs accompany the product through each step of the manufacturing process. This informs workers of the customer value, reminds them that they are working to achieve customer value, and guarantees that customers know that they are getting what they need.

*Constantly Perfecting the Process*

When companies accurately identify customer value, analyze the entire value stream to make it more efficient, and make the value-added steps in the process flow efficiently by letting customers pull value from it, something remarkable happens. The people in every part of the process begin to realize that better results can be achieved with less effort and cost, and that this can continue indefinitely. As the process becomes more efficient, previously hidden waste in the process is exposed. This becomes the impetus for further review and refinement of the product flow. When product teams are in close communication with customers, they can always find ways to specify customer value more accurately and enhance flow and pull in the process. Employees who discover ways to improve the process receive immediate positive feedback, and they realize that they too have a stake in delivering real value to the customer. This encourages them to be even more involved.

In some companies, it is the lower-level managers who are the first to buy into the *lean philosophy*. They propose ways to incorporate *lean* into the enterprise by devising proof-of-concept efforts to show upper management the potential benefits of adopting *lean* on a larger scale. This can be a challenge, but as the business begins to show increased customer satisfaction and corporate profits, the message becomes clear: *lean thinking*, when implemented correctly, can enhance the company's competitive edge.

However, to implement *lean* correctly, you must understand it correctly or you may do more harm to your manufacturing process than good.
Lean Can Be Misunderstood and Misapplied

There is no central authority on what lean is. Lean is an idea that, over the years, has been adopted and refined by many companies. Each company has to discover its own way of making the general principles work within its own organization, and each industry has its own production difficulties. An automotive parts OEM will implement lean principles differently than a semiconductor manufacturer—e.g., automotive manufacturers will work with several value streams per plant while an automotive parts OEM will usually work with one. However, lean “experts” have portrayed lean as a “magic bullet” solution when it isn't.

It is important to realize that there is a lot misinformation and misunderstanding about what lean is. Organizations should “do their homework” to avoid devising a lean implementation that is based on the mistaken belief that it will be successful for their company simply because it has been successful elsewhere. You should be aware of several mistaken beliefs about lean that are common in the manufacturing industry.

Lean Is About Reducing the Number of Employees

When properly applied, lean will result in gains in efficiency that can be used by management to reduce overall headcount, but this is not the goal of lean. The goal is to make the manufacturing process agile and clear of bottlenecks. If there are too many employees working on one step of the process and another has too few, workers can be shifted to balance the effort.

Implementing lean for the express purpose of reducing costs by eliminating jobs will not necessarily solve your manufacturing problems—in fact, it may create more problems. Your employees will not be motivated to support the lean process improvement plan or, for that matter, any future process improvement plan if they believe it may cost them their jobs. It is more beneficial to use these efficiency gains to grow the business, without increasing the number of necessary resources.

Lean Is About Making the Manufacturing Process Faster

Lean is used to facilitate the manufacturing process and to create customer value while reducing waste. This may result in a faster process overall, but not necessarily. Smoothing the product flow may make it necessary to remove workers from one stage of the process so that that stage doesn’t produce more than the next manufacturing stage can handle. If your lean implementation is designed only to speed up the flow, the synchronization between your manufacturing stages may be even worse than before. This would be a very costly mistake for your organization.
Lean Is About Making Everyone's Work Easier

Thinking that improved productivity can only be achieved by working harder is a common misconception in the business world. There is no consistent correlation between effort and productivity—sometimes it can take more effort to perform a task efficiently than inefficiently. Lean is only concerned with the question “Is the entire effort of the worker directly contributing to the customer value of the product?” Any other considerations can result in underutilization of worker resources.

Lean Is About Reducing Inventory

It is true that a reduction in inventory throughout the product flow is a result of the increased efficiency achieved by lean. However, to make the overall process flow smoother, it may be necessary to increase inventory at certain stages of the manufacturing process and at certain times.

Also, it may not be necessary or desirable to cut inventory immediately. If you cut inventory without assessing the minimum inventory required to maintain timely deliveries to the customer, you may miss scheduled shipments. It is often better to reduce inventory in a controlled and gradual way, while looking out for signs of bottlenecks in the process flow.

Lean Is Only About What Happens on the Shop Floor

The historical connection between lean and the Toyota Production System leads many people to think that lean is only concerned with the workers who are directly involved in manufacturing the product and the manufacturing processes. It is true that this was the original concern of lean, but the principles of lean can also be applied to other business processes, such as the processes of payments and procurements, and personnel management.

In fact, the lean philosophy works best when it is applied to all corporate operations. Bottlenecks in personnel management and payments will have an effect on manufacturing, so removing waste and improving flow in those areas will eventually increase the customer value of the product. It is important that lean principles live in the back office as well as on the shop floor.

Lean Is Time-Consuming and Costly to Implement

To a company that only wants to fix its immediate problems quickly, lean can seem like it’s not worth the investment in time and cost. However, for an organization to even begin a successful implementation of lean, a lot of time, energy, and money must be spent getting buy-in from all levels of management for the project, educating the workers so that they understand their parts in the process, and analyzing the existing management system to determine what needs to be changed.

At the same time, lean does not have to be (and should not be) inordinately time-consuming to implement. The steps to prepare an organization for lean are well-defined and effective. And the time, energy, and money spent in implementing lean will be reclaimed many times over when the manufacturing process becomes more efficient. A company should be more concerned about the time and resources wasted in trying to maintain an inefficient manufacturing process over time than the resources invested in a lasting solution to manufacturing problems.

Lean Is Not About Software and ERP Solutions

A common impression is that once the job of implementing lean is done, high-quality products will always be produced, waste will no longer be a part of the process, and customers will always receive
their shipments on time. People often forget that a fundamental principle of lean is “continual improvement.” Business conditions change constantly, and as an organization evolves to adapt to the changes, the implementation of lean in the process must also adapt. This means that the way lean principles are applied must be continually monitored, reviewed, and improved.

Before enterprise resource planning (ERP) software became cheap enough for most businesses to use, changing customer demands were communicated in the manufacturing plant by the use of cards sent along the assembly line with the product. As we described above, this is referred to as the kanban system. It was a good way to communicate the information, but any system that is based on transferring physical notes between a large number of workstations will unavoidably involve the risk of lost or damaged cards, or cards that aren’t routed to the right destination. A messaging system based on a network of computers running ERP software is faster and more reliable—and it’s trackable. It more closely integrates all elements of the value chain.

While lean philosophy does not require the use of software tools that can aid messaging and automate the monitoring of the product flow, software that is powerful, agile, and cost-effective can add significant customer value to the product. The key is that the software solution must not get in the way of the product flow, and it must be flexible enough to adapt quickly to changing business requirements.

To give you an idea of how such a software solution has been used successfully, we will describe how lean principles and Glovia software have been used to solve the business problems of a major player in the automotive OEM market.

A Lean Implementation Using Glovia International’s ERP

Keihin America has been one of the largest suppliers to the automotive industry since its founding in 1982. Its main products are engine management systems, automotive climate control systems, and transmission control systems. It is the American subsidiary of the Keihin Corporation of Japan, which was founded in 1958 and has been a long-time supplier of automotive parts to the Honda Corporation. Honda is also the main customer of Keihin America, although the company also works extensively with Nissan and Volkswagen. The company is a large OEM, employing more than 15,000 people globally and approximately 2,500 people in North America. It operates five manufacturing plants in the United States and Mexico. Business is robust, with sales for the 2013 fiscal year more than US$1 billion.
When Keihin America began its partnership with Honda in the 1980s, Honda forecast sales for a time period of up to six weeks. This gave Keihin six weeks to set up production lines, allocate resources, and build and ship the product to Honda. At the end of the 1980s, competition in the industry became much more fierce. Honda began to respond to dealer demand for more product option sets, and dealers didn’t want to wait six weeks for delivery. By the mid-1990s, Honda reduced the time frame of its sales forecasts to one week. To respond to dealer demand, Keihin provided a process for dealers to send requests for production changes within one day and to deliver the products to dealers within 18 to 24 hours.

Keihin met the increased demand, but sales volume was still growing exponentially. To meet future demand, the company had two options: get much more efficient quickly or expand its manufacturing facilities and labor base. A few high-level Keihin managers were convinced that increasing efficiency was the answer. They believed that if Keihin incurred the cost of adding capacity to its manufacturing facilities, it could survive by holding its prices constant or increasing them. Keihin’s competitors were choosing to become more competitive by becoming more efficient, and the increasingly competitive environment made it necessary to reduce sales costs to distinguish their products from their competitors. If the company tried to lower sales costs and increase overhead, Keihin’s total value added would deteriorate.

At that time, lean manufacturing was becoming more popular in the automotive industry, and Keihin was aware that several of its competitors were taking a serious look at it. While Keihin had been aware of lean manufacturing techniques and principles for many years, it had not yet considered adopting them. As a member of the Honda keiretsu—a network of businesses that own stakes in one another as a means of mutual security—Keihin had the protection of informal business practices, such as an agreement for one company in the keiretsu to buy the excess inventory of another. This made it unnecessary for Keihin to make increased efficiency a priority. However, having excess inventory was becoming a problem for all companies in the keiretsu in the new competitive environment. The group of managers decided that it was time to change this and devise a plan to incorporate lean into its manufacturing process.

The familiarity of this group — the planning group—with Keihin’s business practices led it to believe that the most important potential benefits of lean were better utilization of space, equipment, personnel,
and inventory management.

A Longtime Business Partner Becomes a Lean Resource

Keihin America had worked with Glovia International’s ERP technology for many years and had a close business relationship with the company. Glovia recognized the importance of lean years before and was making the latest version of its software more usable for lean organizations. Glovia invited Keihin and two other automotive OEMs to help them create this new, lean-friendly functionality. Because Keihin had a process in place for fast communication with dealers and suppliers, it helped Glovia develop modules for customer releasing, which is the ability to get customer demands from its EDI system, and supplier releasing, which is the ability to get the demands to suppliers. Keihin worked closely with Glovia developers to make the modules they were already using work better for them.

Some of these developers had extensive experience in lean organizations and in the automotive industry, and so were able to help the planning group understand lean principles and to begin to apply them to the specific needs of the company. The planning group found a valuable perspective from one of the other companies working with Glovia on the enhancements to the next version of their ERP software. This company was a major competitor. As part of designing the enhancements, Glovia had to discover the differences between Keihin’s business needs versus the competitor’s needs. Glovia developers would tell Keihin, “This will work for your competitor, but not for you.” The planning group learned that lean was not a “one size fits all” solution.

Keihin realized a benefit of its keiretsu relationship with Honda at this time when Honda provided the services of its own lean specialists. These specialists worked with Keihin as contractors, giving the group ideas and education on lean principles. One of their first tasks was to perform a process flow analysis of the company. This analysis uncovered the following major barriers to efficiency:

- **Poor use of space on the production lines.** This was a confirmation of what the planning group had observed earlier. Related manufacturing tasks were not always performed in the same area. So when a dealer requested a production change in the middle of a run, the reorganization and setup of equipment and personnel were not as orderly as they needed to be to accommodate the short production cycles. Too much effort that did not add value to the product was expended in sorting out how and when equipment was to be moved, set up, recalibrated, and which personnel were to be reassigned.

- **Inefficient management of inventory levels.** For example, a factory would produce electronic control units (ECUs) for several car models within one production line by tasking workers in subassembly lines to assemble only the parts that were unique to that car model. The parts that were common to each car model would be assembled in the main production line. When a customer changed its specifications for an ECU designed for one model during a production cycle, inventories of the ECU parts common to all models would fluctuate unpredictably while the production lines were being reorganized to meet the new demand.
• **Poor communication between divisions.** To meet its deadlines in a production change, the Engineering division would launch new product designs without the input of, and in many cases without informing, the Manufacturing division. People in the Materials division would calculate what they needed to meet a production change and would often only consult with people in the Shipping department afterward. These bottlenecks in communication created bottlenecks in production, which routinely had to be resolved at great expense and usually at the last minute.

Keihin and the consultants discovered that the root cause of all of these inefficiencies was a disjointed, siloed approach to production planning. During a production change, each division focused on its own tasks, and the larger picture of how these tasks fit together to deliver value to the customer was lost. Therefore, the main task for Keihin was to apply the **lean principle** of making customer value the primary focus, not tasks and product specifications. This change could not be selectively applied to divisions—it had to be the driving force throughout the entire manufacturing process and involve everyone from upper-level managers to factory line workers.

The planning group realized that the main barrier to making this principle work at Keihin was the culture. As a subsidiary of a long-established Japanese company, and as a participant in a *keiretsu*, Keihin America was a combination of traditional Japanese business culture and Western business culture. Even within both cultures, there were people who were more comfortable with change than others. The planning group knew that managers and workers at the older and more established manufacturing facilities would take the attitude of “Why change? We’ve been doing it this way for years and we aren’t losing money.” The consultants explained to the planning group that this is common: changing the culture is usually the most challenging task of implementing **lean** and the one that takes the most time to achieve.

**Keihin’s Solution: Employee Involvement**

The keys to the solution were employee involvement and buy-in. Workers on the factory floor had to feel that they were just as much a part of making the company operate more efficiently as upper-level managers. Traditionally, management sets the agenda and the other employees implement it. But if a worker on the factory floor were encouraged to think of new ideas to increase customer value and efficiency and empowered to present and prove these ideas to the rest of the company, many of the goals of **lean** could be achieved. Communication would improve and divisions would find ways to work
more efficiently together. Production bottlenecks would be resolved more quickly. The production process would become more agile. It was hoped that all these improvements would add up to more value to the customer.

Promoting this level of employee involvement throughout the organization required the right technology. In particular, the ERP software must make access and communication of business data between employees fast and reliable. Fortunately, Keihin’s long experience with using Glovia software in every aspect of its manufacturing process gave them an advantage that their competitors didn’t have: they had the most capable software for the job.

The Glovia ERP Solution

Glovia’s ERP solution is a suite of integrated modules specifically designed for the needs of the manufacturing industry. It was Keihin’s solution of choice because it had powerful tools to integrate all aspects of the company's operation. It had decisive advantages over other ERP solutions:

- **It is lean-friendly.** Glovia software began as a *lean production tool* for Xerox in the 1970s. Keihin knew its Glovia solution would not have to be adapted to work with its *lean implementation*—all of the *lean concepts* such as Visual Controls, Specialized Work, and Takt Time are built into the tools.

- **It is scalable.** What Keihin wanted from its *lean transformation* was to be agile enough to accommodate more volume and variability in customer demand. It wanted to win more contracts and keep customers happy. Keihin knew that when it had to quickly scale up its production capacity, the company would be able to scale up the Glovia ERP software capacity along with it.

- **It is fault-tolerant.** ERP software is the backbone of the manufacturing process, and any system downtime results in missed deliveries and higher scheduling and inventory costs. The Glovia ERP solution provides Keihin with powerful backup and data-mirroring tools so that IT administrators can quickly bring the ERP system back online after a power outage and ensure that little or no data is lost.

- **It is easy to use.** Employees throughout Keihin’s organization—IT personnel, upper management, line managers, and workers on the shop floor—use Glovia software. It offers different tools tailored to each job, and each tool is easily understandable and accessible to the worker given his or her technical background and native language.

Keihin’s Lean Solution

While working on the specifics of its *lean implementation* with the *lean specialists* and Glovia, the planning group at Keihin hit upon an important realization: Keihin employees could be continually motivated to come up with solutions to make the manufacturing processes leaner and more efficient. The virtue of this idea was that it acknowledged that each worker had the most intimate knowledge of his or her task, not the manager. Ideas would percolate from the ground up, not be imposed from the top down. The workers could then evaluate the solutions and present them to management for approval. The planning group realized that putting this process into place would achieve the goal of employee involvement and the *lean objective* of constantly perfecting the solution.

Cross-functional workgroups would be the foundation of this process.

The Cross-Functional Workgroup Process

At regular intervals, a group dedicated to the task of managing this process would form cross-functional
groups of associates from factory workers to upper management. Then week-long brainstorming sessions would be scheduled with the goal of producing and evaluating five or six ideas for improving efficiency. The sessions would follow this agenda:

1. **Create the solution.** Any member of the group proposes a complete, practical solution to a valid business problem that he or she had encountered, or seen others encounter, as part of the group’s work.

2. **Depict the solution.** The group creates organizational charts, proposed process flows, and other materials to represent the solution. The idea of this step is to add as much “real world” detail as possible and to show what will happen to real people if the solution were implemented. Everyone is encouraged to contribute ideas and opinions as the concept develops.

3. **Create metrics of the solution.** The group gathers all of the relevant data it needs to generate metrics that predict, as accurately as possible, the likely outcome of implementing the solution. Examples of these metrics are projected cycle times, lists of what is value-added in the process and what isn’t, labor costs, and costs of investment. The idea is to prove the proposed solutions through standard methods of business analysis. The business prediction modules, the ability to model data, and the business data aggregation and presentation capabilities of the Glovia ERP software are important resources in this step. A mentor who is well-versed in Glovia technology sits at a computer running Glovia modules during this step. If, for example, the group needs current scheduling data or a quantitative view of the operations of any assembly station, the mentor can provide that immediately.

4. **Decide which are the best ideas and refine them.** The group decides which five or six ideas are the best and comes up with ideas to improve them. New metrics are generated if necessary.

**Benefits**

After this process was established, it took Keihin between three to five years to see most of the benefits. The expected gains in employee involvement and continual improvement of the manufacturing process were apparent relatively quickly, but over time, Keihin also began to see benefits that it didn’t foresee at the planning stage:

- **Manager and worker buy-in.** Because the workgroup made management and scheduling decisions as part of the brainstorming process, the planning group recognized early on that there was a danger that the more traditional, change-averse managers in the company would not react well to the change to lean. However, they discovered that those managers found it helpful that they were presented with solid metrics along with detailed proposals and not just PowerPoint presentations filled with general ideas. They knew that the teams had looked at the costs involved and projected outcomes and savings. This made it easier to decide whether a proposal should be given the green light for further study, and this won over even the more reluctant managers.

Another advantage for the managers is that the process made it much easier to gain buy-in from the workers because everyone knew that the proposals didn’t just come from the top down. Employees at all levels of the organization were more confident in the proposals from the beginning.

- **Worker education.** For many workers, the brainstorming sessions were their first exposure to the kinds of aggregate business data managers work with every day. Even if their daily job is that of a line worker at a specific station, for example, when they see the data, they start to gain a better perspective of how their performance and tasks fit in with the manufacturing process as
a whole. After several iterations of brainstorming sessions, workers bring a more comprehensive understanding of the process to the sessions, and the ideas they generate are better informed and more intelligent.

- **Revolutionary ideas.** In a production line, a fixture is a tool that holds the part to be assembled in place so that line workers can manipulate it. Fixtures are custom-fit to the part, so when the parts are changed in a production line the fixtures must also be changed. During one brainstorming session, an ambitious proposal was made to remove all fixtures from all production lines. The workgroup found a way to make it work and management approved it. Now Keihin no longer incurs the costs of creating and disposing of fixtures. Production line changes are faster and more efficient because Keihin no longer needs to track the fixture with the part. This improves scheduling and inventory management. Many new ideas for improving efficiency have been proposed during the brainstorming sessions that may not have been considered by upper management.

When Keihin America had to choose between building its business by becoming more efficient or expanding its manufacturing capacity and incurring the overhead costs associated with that, the company chose the wiser course and invested in **lean**. Glovia technology continues to play a crucial role in Keihin’s drive for greater efficiency and less waste in its production. As a result, profits and new business opportunities have increased dramatically.

**Summary**

A company that decides to fundamentally rethink its production processes will expect a big payoff for its effort. Without some convincing evidence that it will succeed, businesses will not be motivated to invest the time and effort needed to become more efficient.

**Lean** promises a lot—including increases in production capacity and product quality; reduced production time, inventories, and cost; and consistent and timely deliveries. It is very popular in the industry right now, but how much of the sales pitch is hype and how much is grounded in reality?

The reality is that **lean** is a tool, and like any tool there is a correct, and an incorrect, way to use it. When **lean** is implemented with careful planning based on an understanding of what it can be expected to achieve, the benefits are real. When **lean** is implemented based on a misunderstanding of its basic principles, a lot of labor, time, and money can be wasted by a “solution” that can actually make the problem worse. A company that is in short-term, crisis-mode thinking may mistakenly turn to **lean** as a quick fix for its problems. It isn't a quick fix. It is a substantial investment for long-term profit that requires continuous re-evaluation and refinement.

It is important to remember that **lean** is not a “one size fits all” philosophy. There are standard principles that must be applied to any **lean** implementation—such as “increase customer value” and “reduce waste”—but the specific limitations, strengths, resources, and production needs of each organization will dictate how those principles are realized. The way you use **lean principles** to manufacture vacuum cleaners will not work for automobiles. Implementing **lean** requires creativity and a deep knowledge of a company's operations and culture as much as it requires keen and thorough analysis.
Your success with *lean* will in large part be determined by how well you handle the social aspects of the transition. The best *lean production system* will fail unless everyone in the organization is sufficiently educated on their part in the system, and empowered and encouraged to make it better. If *lean* is used only to reduce headcount, the worker goodwill needed to make the production system more efficient will be lost.

The software you use will also be an important factor. Your ERP and MRP solutions must, at a minimum, not hinder the production process in adding customer value to the product. Preferably they should play an active role in adding customer value by making the process more agile in response to changing customer demand. Glovia develops ERP software that has been designed for adaptability, scalability, 24/7 availability, and ease of use.

*Lean* is a hot topic in the manufacturing industry right now, but fundamentally it is only the latest development of an idea that is as old as industrial production itself—the idea of making production as efficient as possible. You should look past the hype and make your approach to *lean* informed and intelligent. Then you will realize the real benefits of *lean*, and your company may become the next *lean* success story.

### For More Information

The following is a short list of websites and printed materials that will give you a better understanding of the material covered in this white paper:

- [www.glovia.com](http://www.glovia.com)

Refer to this site for a description and history of the company that develops the GLOVIA G2 ERP system and its other process management tools, glovia OD and glovia OM.

- *The Machine That Changed the World: The Story of Lean Production*

This book was written in part by James P. Womack, a renowned researcher with decades of work on lean production principles. It played a major role in the popularization of lean manufacturing in the 1990s.


- *Toyota Production System: Beyond Large-Scale Production*

This is the definitive work on TPS from the person who was most responsible for its creation, Taiichi Ohno. It includes a description of Kanban and Ohno’s seven categories of waste in the manufacturing process.

• *The Principles of Scientific Management*

The study of scientific management is the foundation of lean. This is the signature work on the subject by the Father of Scientific Management, Frederick Winslow Taylor.