

# **Managing By Problem Solving**

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## **Management Practice for the Lean Enterprise**

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Michael Ballé<sup>1</sup>, ESG Consultants et TELECOM ParisTech

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<sup>1</sup> [michael.balle@orange.fr](mailto:michael.balle@orange.fr).

Lean is a system to make people think. Lean is not just about building “leaner” processes, nor is it about developing powerful tools that increase value and eliminate waste. Above all, lean represents a radical change in *management*. Lean managers frame all their activities as ways of organizing how people work so that they must constantly reflect upon and improve how they are producing value. Lean management can be characterized as *managing by problem-solving*.

Understanding this framework enables one to understand many well-known lean tools and methods in a new light. Just-in-time systems, for example, are not designed simply to reduce inventory and produce uninterrupted flow of goods; rather they are methods that force individuals to see and respond to problems at the very time they occur. And Jidoka, or built-in quality, is not just a way of insuring higher-quality products by removing the sources of waste in the production stream: it is a core value relying on the ability of individuals, coached by managers, having the means and the methods to solve the right problems as they emerge.

This way of understanding lean helps explain why companies who have used Toyota as an exemplar of “lean” have tried hard to copy Toyota’s processes (which it believes are the company’s source of competitive advantage), only to be disappointed by the results of their efforts. They can poach Toyota’s manufacturing engineers to design a Greenfield “lean” plant, with pull system, andon chords, standardized work at each stations and all the just-in-time bells and whistles, only to see it flounder and fail to deliver lean performance in terms of product quality, stock turns and productivity—at considerable investment. That’s because they are trying to achieve the wrong goal! The truth is that lean is not so much a *process* revolution as much as it is a *management* revolution.

Ever since Frederick Taylor demonstrated over one hundred years ago that engineering work studies could dramatically improve productivity, senior managers have hired engineers (or, heaven forbid, consultants!) to design the best possible processes in the form of equipment and computer systems, and then ordered line management to make sure workers follow the procedures and make the system work. Senior management’s role in this system is to continuously invest in newer, better systems and equipment, to keep operations competitive and deliver results. This orientation has always been controlled by financial

considerations with little consideration to the human factors of resistance to change, insufficient training, turf wars and so on.

Toyota's lean thinkers walked a different path many years ago. They assumed that no matter how gifted and hard working their engineers were, processes would always be broken: resources are organized vertically by functions (for investment concentration, knowledge, span of control, careers, etc.) whereas customer value is delivered horizontally. This type of matrix will inevitably break down. No process can ever be declared perfect, so it's line management's job to work with the people who actually do the value-adding work to continuously improve the existing process in order to deliver better results for customers, themselves and eventually the company.

Toyota's lean processes are not the result of clever design, but of the continuous, unflagging, antlike work of millions of workers and frontline managers who, idea after idea, have created better processes from the base they were given. As they did so, they also evolved the disciplines needed to keep these new systems working at the desired level. As engineers learned from the continuous improvement work, they designed greenfield processes to take into account the innovations, which eventually produced the illusion that lean process are designed so from scratch. They are not. They are the outcome of a specific form of management which aims at developing people by making them think.

And so managing by problem-solving represents a profound change. Ordering people around is easy enough. Making them think about how to improve their own performance is not. Experienced lean practitioners have developed a number of specific techniques to make people think about how to "lean" their own processes and deliver superior performance without additional investment. This "lean management" is drastically different from traditional management practice and is based on developing people by making them solve specific problems to improve the way *their own processes deliver value to customers right now!*

Consider just-in-time. The just-in-time systems Toyota has come up with are not so much about producing just in time – no one knows how to do that – but about making sure that people visualize that they are *not* producing just in time, and *making them think* about why, so that they can come up with a local solution. As stock levels decrease in the process, any just-in-time supply chain becomes far more sensitive to any exceptional problems, from snow in the winter or truck driver strikes, to employee holidays in the summer period or supplier

short shipments. No problem comes twice in exactly the same manner, so no set system, no matter how cleverly designed, can be expected to cope with just-in-time conditions. The only way to keep any process in just-in-time conditions is to keep everyone involved thinking about 1) avoiding overproduction and missed deliveries and 2) solving local problems as and when they appear. Over time, processes improve as inefficiencies are taken out of them, and “average” people learn to manage them – as long as they keep *thinking* all the time.

Likewise, the principle of built-in quality, or Jidoka, is tied to Toyota’s emphasis on producing people before producing parts. Toyota’s commitment to “completely satisfied” customers came about in a rather unexpected way. In the late 1890s, after many, many attempts, the inventor Sakichi Toyoda developed an automatic loom which could identify when a thread was broken and stop the loom rather than produce defective cloth (normally, the loom keeps spinning and weaves fabric with a missing thread). This enabled the operators to focus quickly on the problem and fix it, and therefore avoided wasting material producing defective products, and also triggered a staggering productivity improvement. As the machines became capable of identifying a non-conform and stopped on their own, fewer operators were needed to “baby-sit” the machine, and one person could now manage ten times more equipment than before – as long as they reacted immediately to every machine stoppage. At first, the loom company saw this only as a source of direct labor productivity (they needed fewer operators per shop), but progressively, they saw two further benefits – first, the loom operation realized that if they hurried to fix every problem as they appeared, they made far more money from utilizing the equipment more fully. Secondly, they realized that if they focused on understanding why the thread broke, they could reduce the number of incidents, and fix problems at the root cause.

Over the years, Toyota developed this concept of “Jidoka”: an operator or a machine detects a problem and communicates it, which means that a situation deviates from the normal workflow, so the line is stopped and line management removes the cause of the problem, and finally, the resulting improvement is included in the standard workflow.

Jidoka simply cannot be practiced in traditional, hierarchical, top-down numbers-driven organizations. In centrally controlled organizations, resource owners simply cannot know what is happening with uptime and quality and scheduling *right now!* Consequently, they manage their equipment and people by trying to solve the main issues themselves, and insist that everybody else down the line either apply procedures or do what they’re told. Indeed,

managing-by-numbers was invented at General Motors to enable managers, the “brilliant” people, to handle larger and larger resource pools. The not unreasonable assumption is that the company’s bottom line is the addition of each unit’s profit and loss statement. As long as units are making their numbers, they can be assumed to function properly, and if a unit is not meeting its target, management can focus on this and “fix” the problem – usually by investing in a “plug-and-play” solution: new machine, new system, new manager, etc.

The Jidoka concept is radically different: every operator must solve every problem right now. Of course, they can’t do it on their own, which redefines management’s role: managers must help every operator to solve every problem right now. In a just-in-time environment, this is all the more essential because if problems are not solved quickly, the entire line stops. As Gilberto Kosaka, a Toyota Brazil veteran describes it, lean management of production is about continuous flow, stop for quality problems, continuous flow, stop, continuous flow, stop – and the tension between trying to flow parts continuously but having to stop at every product concern is what makes people *think*.

What might appear to an outsider as a relentless approach to process improvement boils down to no more than a system designed to ensure that people are organized to solve problems. As with just-in-time scheduling, the key to having better control of each process is to ensure every person involved is thinking about performance all the time. To do so, the system maintains a constant tension on the process: if the right parts are not delivered at the right time, the line stops; if a quality concern is raised, the line stops. As Toyota’s chairman says: “At the start [of production], the line keeps stopping, for example. Even when you see it, it is difficult to understand.”<sup>2</sup> It is very difficult for any resource owner to understand that you deliberately stop the line. And, of course, for this system to work management must be entirely focused on solving problems quickly to maintain the continuous flow! The only practical way to do so, is to manage people so that they *think*: see problems and resolve them continuously. This radically redefines the work of management. When a former Toyota Motor Manufacturing North America president was asked by lean expert Jeffrey Liker about his greatest challenge in teaching the Toyota way to American managers, he responded: “they want to be managers, not teachers.”<sup>3</sup>

## **MANAGING BY PROBLEM SOLVING FOR BETTER PROCESS PERFORMANCE**

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<sup>2</sup> Fujio Cho, quoted in Day, P., ‘Mr Toyota’ is shy about being No 1, BBC news 2007

<sup>3</sup> Liker, J. & D. Meier, 2007, Toyota Talent, McGraw-Hill, New York

Why would ‘managing by problem solving’ lead to better processes and better results? First, this approach requires a drastic shift in management focus. Rather than administering key resources to make the numbers, managers now have to improve quality, lead-time, and cost performance of the areas they’re in charge of without investment. In order to understand and improve quality and lead-time, they must talk to their customers frequently (and pretty soon, to their suppliers as well), and strengthen the day-to-day links across the customer supplier chain. In order to reduce costs without investment, they must talk with their employees daily to understand the source of the cost, the waste in the system, and encourage people to come up with ways of getting rid of it.

“Why do you think Toyota has been successful so far?” asks Katsuaki Watanabe, Toyota’s President, “We’re doing the same thing we always did; we’re consistent. There is no genius in our company. We just do whatever we believe is right, trying every day to improve every little bit and piece. But when 70 years of very small improvements accumulate, they become a revolution.”<sup>4</sup> Brilliant processes are not hatched brilliant from a process engineer’s mind – they become so through years of learning and improvement in small and large steps. A new Toyota plant is designed according to the learnings obtained from the previous generation of plants. No one chases for flawlessly designed computer-managed perfect processes. They focus instead on the current situation: understanding and visualizing its problems to help everyone get to work at solving problems. The process will remain broken—but less so than when the work began. After several learning loops on how to fix customer concerns quickly, how to better schedule the flow of work through the process so that only needed work is done when it is needed and in the needed amount, and how to maintain every operation’s quality and productivity, the process will deliver a much higher performance level. And it will look and feel very differently – it might even seem brilliant to competitors. But it’s not, not really. It’s less broken than when it started, with much room for improvement still. The price to pay for consistently higher performance is that people have to be kept *thinking* at all times – and that’s management’s job.

### **LEAN’S MANAGEMENT REVOLUTION**

Managing by problem solving to continuously improve the capability and cost of our processes undeniably makes good business sense, and the managers who “get it” succeed

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<sup>4</sup> Watanabe, K., ‘Lessons form Toyota’s Long Drive’, *Harvard Business Review*, July-August 2007

spectacularly at their job. They tend to be the few to whom “making people to make parts” comes naturally and they come to understand how difficult this is to do in most organizations. Setting up a system to make people think is hard work because it goes against some fundamental assumptions built into how management systems are currently designed. Endless practical difficulties get in the way: your manager might schedule endless “progress status” meetings when you’d rather be on the shop floor working on issues with frontline employees; corporate staff might impose new rules and regulations about how to implement lean rather than allow you to focus on how to best implement them locally; or there might be endless turf wars about whose problem this really is rather than work as a team to fix it and understand that there is no point in arguing about whose side of the boat the hole is on. Before we go into the specifics of how to manage by problem solving, it is important to grasp the key changes needed in management *attitude*.

*Value is created at the workplace*

By far the largest management revolution implicit in managing by problem solving is replacing the current *centralized* management control system by a *distributed* management control system. Most managerial departments operate as if they were oil tankers: the reporting systems report data to the control room where the captain sits, he looks at all the screens, steers, and passes orders down to the engine room. This is a “make it so” kind of environment where the management team meets regularly with slides and numbers, comes up with action plans, and then tells its delivery teams to, well, deliver. Conversely, managing by problem solving is like running a sailboat. Each operator holds a sheetline that controls a specific sail. The sailboat’s performance comes from all the sails being adjusted to wind and wave conditions *now*. The skipper’s job is to walk to each crewmate in charge of a sail and discuss their interpretation of how the sail is behaving and what they can do to set it better. The skipper still needs to do the centralized tasks of setting a course and making sure the ship’s books are in order, but at least half her time is spent walking to distributed control points (sails, water in the bilge, etc.) and discussing with the operator what the problems are and how they’ll resolve them. Katsuaki Watanabe describes this distributed management control system thusly: “I have just been telling everyone in the company that we should do properly what we are trained to do. I can check how well people understand the Toyota Way in day-to-day management in any function. I visit different places to find out myself.”<sup>5</sup>

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<sup>5</sup> *Ibid.*

One main difficulty in adopting a lean management style is knowing what to look for on the shop floor. In the traditional system, managers are expected to have all the answers, because they're supposed to make all the decisions. This is awkward, because many managers might have stronger financial skills and numbers acumen rather than deep technical knowledge. And so they might feel uncomfortable when operators explain problems to which they don't have immediate answers. They must resist the natural urge to appear in control—to provide answers that justify their authority. The necessary skills to visiting the shop floor lie in *learning to see*, and then learning to listen to problems without having any quick fix. Indeed, the idea is to discuss the problem more fully with the operators but *not suggest any solution* – this is the key to developing shop floor employees. Learning to see is a core lean commitment that never really ends. You can always learn to see the workplace in greater detail, with greater understanding – if you are interested.

### *Challenge all things large and small*

Another fundamental change in management practice is about eliminating waste from management work by getting staff to get the *right things done* rather than insist that they do the wrong things well. This means working backwards from a current state to discover the root cause of waste or flaws rather than jumping to conclusions about quick fixes. Such an approach focuses diligently on challenging current state. In all workplaces, managers ask the essential question: *what do we need to learn* rather than what do we want to do? Asking 'why?' repeatedly works both in problem solving to steer staff towards the root cause, but also to explore their proposals and plans. Employees are seldom idle at work – they want to do a good job. But rather than looking for the lost key under the lamp because that's where there is light, they tend to insist on doing what they want to do, without questioning this very much. Challenging one's staff constantly is definitely an acquired skill. Whether on strategic issues such as which markets and technologies to be in, or in detailed shop floor issues such as what is going wrong with a machine, a customer or a computer system, leaning processes means challenging the current thinking and asking 'why?' until staff start using their frontal cortex and think about it, rather than follow their memory reflex.

Focusing on what we need to learn rather than what we want to do can lead to dramatically different business outcomes. A Detroit car executive explained how in the eighties, Toyota and an American automaker were looking jointly into hybrid engines. They both concluded that the market for a hybrid engine was very small and that it would be unlikely to make



money soon enough to recoup the initial investment. The US company decided that the business case was too weak to invest in developing the technology, whereas Toyota concluded that building greener engines was something it really needed to learn how to do. Twenty years later the executive still expresses doubts about whether Toyota made any money on the Prius hybrid car. One thing he had no doubts about though, is how hard it is to sell cars when you're seen to have lost the technological edge. By investing in developing hybrid engines, Toyota focused on what they needed to learn, and thus continued to disrupt the market for its competitors by solving a problem for today's customers with tomorrow's technology.

Managing by problem-solving has important implications for lean leadership. The challenge of lean is to satisfy customers with world-class quality while reducing costs to make a profit at local market price. To do so, you must learn to challenge everything, from the strategic goals (are we focusing on what we need to learn rather than what we want to do?) to any immediate action (what is the problem you are trying to solve?). Leadership is usually seen as having a grand vision, taking bold decisions, and convincing followers to make it so. The lean approach to leadership is wholly different. It's about agreeing on what the real challenges are and working on them together. It's no less bold, nor less decisive – it's something else. Soichiro Toyoda summed it up in the “Three Cs”, Creativity, Challenge, and Courage: "The third C is for courage. It is most important to take the relevant factors in all situations into careful, close consideration, and to have the courage to make clear decisions and carry them out boldly. The more uncertain the future is, the more important it is to have this courage."<sup>6</sup> According to Toyota veteran John Shook, the leader's role at Toyota is first to get each person to solve problems and improve his or her role and, second, to make sure that each person's job is aligned to provide value for the company and prosperity for the customer.<sup>7</sup>

*Process standardization is obtained by improvement—and leads to greater improvement*

Standards are fundamental to lean management. In lean, *a standard is the agreed best-known method to reach a certain level of performance*. We assume that what works for one person would actually work for another in similar circumstances, and that people don't live in a vacuum, but surrounded with experience and knowledge, if it can be mobilized. Standards are neither

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<sup>6</sup> [http://www.toyota.co.jp/en/vision/traditions/nov\\_dec\\_03.html](http://www.toyota.co.jp/en/vision/traditions/nov_dec_03.html)

rules nor procedures to be blindly applied, but a collective agreement on how to perform certain acts most effectively. Standards are easier to respect than rules because they are part of a learning mechanism. The deal with employees is that before they complain about the method, they must demonstrate that they apply the standard to the best of their ability. Not in the spirit of “just apply the procedure”, but to try to spot and understand with the employee specific difficulties in working with the standard method. The manager-employee dramatically shifts from “can’t you do as you’re told?” to “let’s figure out how we both understand the standard.”

This leads to a complete transformation of the mode of *control*. If the performance is not achieved, the standard method is examined and sticking points identified by both managers and employees. At this point rather than tick a “no” box on the audit sheet and move on, managers can discuss the why and wherefore of the difficulties and ask workers to suggest ways of making the standard work. If a suggestion performs consistently, everyone can agree on a better method and change the standard accordingly. Star employees are not those who can turn around the system to get results by cutting corners, but those who demonstrate they can follow the standard, show the problems and provide suggestions. “Standardize-and-improve” is still command-and-control, but in a radically different employee-manager relationship.

Seeing standardization and improvement as two sides of the same coin is far from intuitive in the traditional management mindset. A Toyota area manager once demonstrated this by showing how the position of everything in a production cell was visualized by yellow tape on the floor – not paint. “This is the current standard,” he explained. “We can see whether everything in the area is at its standard place, just by looking whether containers are within the yellow tape square. When they’re not, we can ask ‘why?’ and ask the team member to please follow the standard until we’ve come up with a better way of working.” But what about the places where tape is ripped away through usage? Why not use paint? “The point is that as tape fritters away, we know we have to replace it. When we replace it, we ask the teams to retape the area – but differently. How could they change the location of everything to eliminate movement waste?” By standardizing location, the team can follow a routine process without having to look for parts and tools, as well as visualize the wasted movements at every cycle. By redoing the standard, the teams improve the process. The standard is maintained because team members care about process improvement.

Improvements are possible because they work with a standard. Keeping to the standard and challenging it is a basic way of *making people think*.

Managing processes in a lean way requires managers to make a considerable mental shift: process standardization is obtained by constant *pressure on improvement*, not by obsessing with thoughtless rule application. Discipline in the execution of standards is not obtained by carrot-and-stick compliance, but rather by engaging employees in constant continuous improvement. Rather than manage their motivation, managing by problem solving focuses on people's attention, and a "problems first" attitude. To see problems, standards must be maintained, and to solve problems, they must be improved. Broken processes get to be brilliant over time because every employee is expected to think about how the current standard could be improved to better satisfy customers and eliminate waste, without investment.

*Responsibility is more important than authority*

Managing by problem-solving shifts the emphasis on how individuals make decisions and take ownership for enacting change and getting things done. Rather than enforce rules with a proscribed amount of power, individuals gain the appropriate amount of understanding about a situation to make the right decision. They acquire the authority to make a decision by exploring and gaining agreement from others about what the best decision should be. John Shook, one of the first westerners to work in Toyota city and to experience the lean culture firsthand, points out: "Good Toyota leaders don't jump to conclusions or solutions – they try to first size up the situation and then ask "Why?" This focuses on the work and the problem at hand, avoids finger-pointing and seeking where to place the blame. It also keeps responsibility with the person who is doing the work, which is what truly engages and empowers the workforce. Toyota would say that this is essentially the P-D-C-A cycle they learned from Dr. Deming. Yet my own observations say this is precisely the thing that most companies can't seem to do. Why? Surely one major reason for this is the way we lead and manage."<sup>8</sup> In traditional management cultures, as resources are organized vertically, we tend to associate responsibility to authority: this is my department, my people, my machines – they are under my responsibility. Not surprisingly, a major feature of management life are turf wars over who is responsible for what and under what authority.

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<sup>8</sup> Shook, J., Lean Management and the Role of Lean Leadership, Lean Enterprise Institute Webinar, 2007

Managing by problem solving changes this considerably. People are held responsible for solving a problem, regardless of what area of authority is delegated to them. Engineering graduates who join Toyota are taught this discipline. They spend their first months working on the lines as team members and in showrooms as salespeople to understand assembly and customers. Then, for as long as two years, they will be asked to solve engineering problems before they actually design parts. This has two main consequences. Firstly, in solving technical problems they learn about parts and processes. But secondly, problems are usually distributed in the process across functions. In order to solve problems, junior engineers must go and talk to people outside their department and convince them that they have correctly understood the problem and that their solution makes sense. Telling people what to do is not an option: one has to persuade them that this is a good thing to try. Everyone's views are taken into account, even if, in the end, another path is chosen. The people concerned need to be convinced to experiment with this path. In traditional companies, often in staff structures, junior people are also asked to solve problems, but in a very different way. Usually they are asked to explore solutions proposed on the market, to pick the "right" one, and once support is needed, it's in the form of high level clout from a senior manager to tell the rest of the organization: "do it!" In the lean environment, support comes as being coached in problem solving (please go more deeply in the problem, you still haven't identified root cause) and in being steered towards the right people to talk to in the organization. In Toyota, the responsibility for obtaining information squarely rests on the person who *needs* the info, not the person who has it.

This approach builds stronger teams. A key aspect of broken processes is that work is done in one department and then passed over the wall to the next downstream department. This is usually done automatically with minimal communication. Processes work like a relay swimming race: the next swimmer waits on the side of the pool, ready to plunge, but can only do so when her preceding teammate has touched the end of the pool. If the teammate slows down and flounders, too bad – the next swimmer must stand there and wait, there is nothing she can do to help. In a running relay race, however, runners can run backwards to help a flagging teammate and pass the baton early rather than late. This will mean a longer run for the next runner, but the process is continual, and the flow is better. These are two differing structures of individual responsibility and team responsibility. In the swimming race the mental model is "I'll do my job if everyone else does their's." In the running race, the model is "I have my job to do, but I must also help my teammates so the team succeeds collectively." A crucial way to get broken processes to work better is to make sure people

work together across departmental boundaries because they have a clear understanding of the purpose of the entire process and its status right now.

Teamwork is about cooperating across functions. This means acknowledging all stakeholders' problems within the company or outside, reaching out to the community and society at large. To employees, work is not just a specific job, but also membership in a team. Managers need to learn to foster an environment where employees can work together in stable teams and help each other in need. Cooperation is the key to both performance and developing rewarding relationships at work, where, after all, we spend most of our daylight hours. Furthermore, in our increasingly complex work environments, any activity has a staggering number of stakeholders. There is little chance of expecting either support or cooperation if they feel that benefits and costs are not fairly shared. It's up to the manager to move his teams away from "us versus them" (not my problem, let them deal with it) to "us with them" (what can we do to help?) Sharing benefits and costs is also the key to sharing experiences and progressing from individual learning to collective learning by spreading knowledge and best practices. Individual responsibility is clearly linked to team responsibility because you don't want to let the team down.

Involvement here has to be distinguished from simple *communication*. At many workplaces, management has learned from previous continuous improvement efforts the importance of communication, and so boards appear here and there covered with powerpoint charts of indicators. This is not involvement. To a large extent, this has the contrary effect on operators: they see what is going on, but can't affect it. Involvement is about asking one person to track her performance herself, analyze why it goes up or down, and suggest practical ways of improving it. *Involvement* doesn't happen until the operator actively *participates* in the story rather than simply being an audience for management speaking to itself. Involvement is about blending both control over one's environment and shining within one's team in *useful* ways from a process and performance point of view. In this sense, involvement is very precise and hinges on management's understanding of standardized work and continuous improvement. The original 1977 paper on the Toyota Production System explains the full utilization of workers capabilities by "a system of respect for human, putting emphasis on the points as follows: (1) elimination of waste movements by

workers; (2) consideration for workers' s safety; and (3) self-display of workers' capabilities by entrusting them with greater authority and responsibility.”<sup>9</sup>

### *What about motivation?*

How can an operator on a production line have any control over her environment? We all have in mind the tragic, hysterically funny images of Charlie Chaplin in *Modern Times* when the tramp loses his fight with the machine to such an extent he himself becomes an item on the conveyor belt. This doesn't have to be the case. For instance, TPS asserts that stopping production at every defect is the only way to improve lines so that you won't have to stop production. Consequently, lean production lines have an alarm system by which the operator can call for help if she has any doubt, and a team leader will come and check. If the problem can be resolved within minutes, the team leader turns off the light, if not the entire production chain will stop. The operator can effectively control her environment to the extent that she can call a team leader, trigger a material handling alert to call a material handler if she is uncomfortable with the number of components at her disposal, and ultimately stop the entire production line, which in a just-in-time system can lead to stopping the whole factory. This is quite a bit of control. Oddly, the only way to exert this control in practice is to have a good grasp of standards in order to understand when pulling the help cord is relevant (out of standard). This “*andon*” system has been known and described forever, but in most Western lean implementation “roadmaps” it appears way down the timeline, if ever. The general feeling is that we'll get around to that when we're ready, first let's do all this just-in-time stuff. This profound misunderstanding of the kind of working relationship lean tries to establish between management and workers, to focus every one's efforts in solving problems *now* is symptomatic of many lean failures. Ignoring the react-at-first-defect principle of TPS also denies the operators the control they can have over very standardized jobs, and therefore dismisses any possibility of their involvement.

In one plant I visited, the alarm cord had been installed by the corporate lean team but with no apparent effect on quality. When queried about how defects were handled on the line, an operator explained that each time they spotted a defect on the products, they'd stick on a red sticker which was then picked up at final control and fixed at the rework station. “What about the call cord?” he was asked. “Oh, that? It was really good when they installed it and

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<sup>9</sup> Sugimori, Y., K. Kusunoki, F. Cho & S. Uchikawa, ‘Toyota Production System and Kanban system Materizlization of just-in-time and respect-for-human system’, *International Journal of Production Research*, 1977

quality really improved, but because there were so many problems and management was disturbed all the time, they told us not to use it anymore.” Not only is quality not improving in this plant, but operators are back to being cogs in the machine with no control over their environment. Worse, they have learned to recognize quality concerns, but can’t do anything about it. Installing the system without getting management to question its assumptions leads to one more failure for lean implementation, for the operators, and ultimately for the entire plant.

In the traditional command-and-control frame, managers are expected to apply procedures or think up solutions to problems and get their teams to apply the remedies they’ve concocted. The manager is the brain and the employees the hands. If the employees apply well, they are rewarded with approval of their manager and if they don’t, they earn his or her irritation. The problem is, of course, that the manager’s response to local situations is rarely a perfect fit, that most procedures have not been dreamed up to take into account the employee’s specific situation and that everyone dislikes blindly applying another person’s solution. Managing for lean operates in a radically different frame. Managers worry about how employees understand their situation, how they understand what is expected of them, and find their own local solutions to local problems. The lean tools are mostly about supporting workers in understanding the problem in detail and visualizing what kind of generic solution to look for. They have to find local solutions themselves. The whole managerial issue can then be seen differently: manage people’s *attention*, not just their *motivation*. Rather than tell employees what to do, and then try to cope with how they feel about it, you and their job, the alternative is to make them understand their situation, describe what kind of outcomes you’d like, discuss how they intend to go about it and why they think it will work and let them experiment. There is no dereliction of responsibility, because you then discuss in detail the outcome of the experiment, and start the cycle again. A degree of control in our environment is such a strong psychological need that this approach short-circuits much of the motivational problem. Evolution has fashioned our brains as natural problem-solving machines, and just as it’s difficult to resist trying to solve a crossword puzzle once someone asks you for help, employees will be self-motivated to solve work problems if their attention is directed so.

The lean management system relies on specific practices to obtain the engagement of employees, more than simply turning up at work in the morning. The two basic motivational practices of managing by problem solving are *people involvement* and *people development*:

- *People involvement*: sharing management objectives with employees and explaining how these objectives are set, why they are important for the success of the company and how this affects their job. Involvement is also helping employees with all the niggling daily problems of the workplace which are not under their control, and which affect how they routinely do their job. They will care about achieving management objectives if management cares about helping them to keep their work environment in control.
- *People development*: training employees to solve performance problems in their own areas of responsibility, singly or in teams. In learning to improve performance (without additional investment) by focusing on daily problems, employees learn to do their jobs better and increase their competence. If this is recognized and rewarded by management, even if only symbolically, it will be a strong motivator in increasing both the degree of mastery people have over their job, and their status in the work team. In effect, by encouraging employees to solve work problems, managers allow them to experience the deep satisfaction of problem solving (the “aha!”), feel “special” in having contributed to improvement and feel that they “belong” in having contributed to the team and the company.

Is managing by problem solving engaging or merely stressful? Both aspects are linked, and a matter of managerial shrewdness. The greatest underlying insight to Toyota’s approach to managing people is that it’s relatively easy to get anyone to do anything if you’ve got authority and push hard enough, but you can’t force interest. Toyota tries to get their employees to use their minds and hearts as well as their arms and legs, and you can’t coerce someone to think – thinking can only spark from interest and paying attention. By studying how people feel at various points of their working day, researchers have found that people feel happiest when they’re totally engaged in a task, much like athletes finding the elusive “zone” of their perfect game, regardless of the nature of the task – whether doing a crossword, checking ball bearings to see if they’re perfectly rounded, counseling others or solving quantum equations in nuclear physics. This feeling of total engagement tends to appear when we find ourselves balanced between the challenge of the situation and our competence to deal with it. Too much challenge and we panic, too much competence and we’re bored. Obviously, this “sweet spot” remains often elusive because challenge and competence evolve randomly in work situations unless carefully managed. Interestingly as



well, when people feel totally engaged in a task, the one thing they hate is being interrupted by anything that breaks their “flow” (as this state of full engagement in productive tasks is termed).<sup>10</sup>

In the context of lean, whether by accident or design, Toyota has hit upon pretty much the same thing: “Responsibility and authority are motivational, whereas there is nothing more demoralizing over the long term than spending time in an unproductive manner. Experience has proven that the more the authority employees have to manage their own work, the more inclined they are to pursue improvement in that work. Employees who can translate their own ideas into visible improvements in production flow and in product quality take pride in their work, in their jobs, and in their companies.

To be sure, the Toyota Production System enforces a creative tension in the workplace. Employees don’t coast. Just-in-time production demands continuous vigilance. Continuing improvements in the name of kaizen demand unflagging efforts to find better ways of doing things. Managers, too, must do their part in structuring a workplace environment that nurtures employee initiative. The overall result, however, is a stimulating workplace: a workplace where employees can take charge of their own destinies.”<sup>11</sup>

It is high time to move away from simplistic carrot-and-stick and praise-or-punish motivational assumptions. Both lean experience and psychological research argue for a different view of motivation based on engaging employees, rather than driving them through rewards and fear. Employees can become profoundly engaged with almost any task if the proper working environment can be created.

### **MANAGEMENT MINDSET CHANGE**

Natural lean thinkers have a radically different attitude about how to make money with an industrial operation, whether in manufacturing or services.

Traditional managers worry about *averages*. They assume that *all things being equal*, if no major disasters happen, keeping things ticking along is what is needed to make the numbers.

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<sup>10</sup> Csikszentmihalyi, M., *Flow : the psychology of optimal experience*, 1991, Harper Perennial, New York

<sup>11</sup> *The Toyota production System*, Toyota Motor Corporation, 1996

In budget sessions, they focus on average rate of return, and dismiss both exceptional gains and, more frequently, underperformance due to unexpected, unforeseeable glitches. Their entire work focus is on letting processes they don't hear about run on their own, and moving from one incident to the next because they feel acutely that problems will throw the "average."

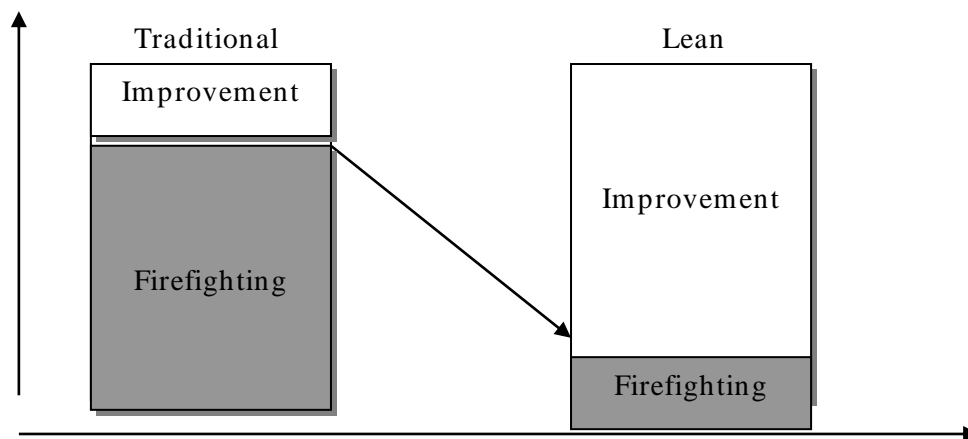
Lean thinkers believe in *potential*. It's a radically different approach to operations. Lean thinkers don't worry so much about average performance. They care far more about the best performance that has been achieved, and the daily gap with that result. They reason that if a given system can reach a certain performance when all the stars are properly aligned, there is no reason not to expect the same performance *all the time*. Lean thinkers don't look at what a process is doing on average now, but at what it could achieve if it was reaching top performance at every cycle. Once the potential becomes obvious, it becomes a "problem" that must be addressed. What kind of working conditions must be created to make it so? There is no fatality, other than a string of pesky, material and human problems. In other words, how can we get the stars to align properly in order for the process to consistently deliver its best performance.

Looking at *potential* rather than *average* radically changes our perception of the workplace. Firstly, although we need to put out the fires, looking at potential places a much greater importance on *normal operations*. Rather than feeling relieved because a process "runs," we can invest our time figuring out what its potential performance could be if it *always ran at its best*. Secondly, as a manager, if you start asking yourself the question of running your processes at their best every second, rather than just good enough, you'll naturally focus on *how the people in place run the process*. Clearly, a competitive sports team needs a different kind of management than a weekend pickup game – and better coaching. If we want processes to run at their best all the time, we will naturally focus on how front line managers understand their jobs, the technical issues in the process and how they coach their team to stay in top form. Thirdly, trying to achieve potential also changes the "if it ain't broke don't fix it" approach to most situations. Any sign of trouble must be investigated and fixed quickly because if not we'll never reach potential! Rather than just move parts down the process, or customers down the line, we need to react at the first sign of something going wrong – because every non conform is a harbinger of worse to come. Reacting at first defect is the best way of seeing how front-line management works with their teams to keep the process at its potential at all times, and how they cope with difficulties *before* the real fire starts.

As managers gain experience in trying to achieve potential rather than being satisfied with average, they also start to look for different types of answers to the many questions they face on the shop floor, which, in turn, leads to a very different managerial outlook. First, in traditional management, one is always looking for a *definitive answer* to most problems, the once-and-for-all fix. Looking upfront for a “final solution” often involves a lot of research, soul-searching and shopping for a one-size-fits-all off-the-shelf solution. Not surprisingly, the perfect fit rarely exists, which triggers rounds of internal negotiation and compromises on picking the most likely to satisfy all stakeholders. Murphy’s Law dictates that once finally implemented, the “solution” rarely fixes the original problem. Managing for lean is very different. Rather than shop around for the perfect plug-in solution, lean managers will seek to train their people to understand the process better by improving step by step. Rather than a once-and-for-all solution, the lean manager seeks to foster quick learning cycles of *ten times ten percent rather than 100% in one go*. This approach has the merit of getting staff to understand the problem in much greater detail and, and ultimately, to challenge the right assumptions leading to the root cause. Sustaining this learning process also implies a profound managerial change. Rather than rewarding people for making the problem go away, the lean manager will challenge them on the remaining issues and get them to challenge the fundamentals of the process. Doing so also completely changes the way we look at people in the workplace: rather than being impressed with the usual *heroes*, we look for *winning teams* who perform close to potential continuously.

This change of outlook has three main benefits. First, aiming for the potential rather than being satisfied with good enough is bound to leverage more results out of the same resources: it’s a *leaner* approach. Second, as teams learn to solve problems which stop them from consistently achieving their potential, they will discover that every issue solved makes new problems appear, and hence that potential can be pushed back almost infinitely – “all things being equal” is simply never the case. This turns out to be the true engine of continuous improvement. As people learn to better run a process to achieve their potential, on particularly good days they will exceed their previous best performance, and hence a whole new potential can be defined. The fascinating part of this process is that the technical questions asked evolve with the potential step-changes, and lead people to radically change their priorities and focus with each new performance level: the results improve continuously because they learn continuously. Continuous improvement is indistinguishable from continuous learning on how to run the process by the teams at the workplace. The third

benefit is that fighting fires becomes far less frequent. By focusing on better running the normal situation, employees understand the process far better, and hence are far less likely to make a mistake or let an incident slip. Problems are therefore less likely to escalate without the proper reaction, at the proper time. The acid test of the lean management system is shifting managers from the traditional 80% firefighting and 20% improvement to 80% improvement and 20% firefighting:



Firefighting is always necessary and can't be dismissed lightly. Customers must be served, regardless of what new problems occur. But if managers focus almost exclusively on solving one crisis after the other, as they are wont to do, basic operations will deteriorate and new fires will break out more frequently. Continuous improvement is a powerful way of controlling the work environment because it requires detailed understanding and knowledge of processes, which also ensures their proper maintenance. In this respect, the standardize-and-improve approach of the lean management system is a powerful way of balancing the inescapable need of putting out fires along with developing the business as well.

Most managers struggle with the lean tools and techniques because they fundamentally misunderstand their purpose. The tools are no more help in solving problems than a telescope is in stopping meteor showers, or a microscope in eradicating viruses. The tools are nothing more than rigorous ways of highlighting issues in *normal* operations. Managers looking for plug-in solutions to their problems keep being disappointed by their lean "implementations." On the other hand, the managers who understand that the tools are essential to get people to learn how to run their processes to full potential, *use* the lean tools to often spectacular effect. For most of us, seeking true potential in a "ain't broke" situation doesn't come very naturally, unfortunately. Most people are "satisficers" (happy to settle for

“good enough” and the first alternative that makes a concern go away) as opposed to “maximizers” (always aiming to make the best possible choice). Consequently, the lean management focus on constantly looking out for the true potential needs to be practiced. In order to change their style and lead others towards continuous improvement, managers must first acquire themselves a *new frame of lean glasses*: a way of looking at operations which underlies lean systems and tools. Up to now, lean implementation has been left to those managers who instinctively grasp these glasses and feel personally comfortable with them. Those who don’t, don’t understand lean advice from the *senseis*, misinterpret the tools and feel frustrated with the lean implementation demands put on them as one additional thing they have to do while they struggle with the usual set of issues the workplace throws at them. Taiichi Ohno, a legendary pioneer of lean at Toyota has this advice:

“There is a secret to the shopfloor just as there is a secret to a magic trick. Let me tell you what it is. To get rid of waste you have to cultivate the ability to see waste. And you have to think about how to get rid of the waste you’ve seen. You just repeat this – always, everywhere, tirelessly and relentlessly.”

### **MAKING PEOPLE THINK**

Mindset change doesn’t happen overnight, or easily. More to the point, mindset change does not happen by thinking too much about it, but by doing. Managing by problem solving is how: the basic practice for managers to *change their mindset is by doing*. Managing by problem solving makes a lot of sense to those who want to improve both process performance and staff morale, but it’s hard work. Not that managers are afraid of hard work – this is hard work in a *different* way. As discussed earlier on, people can be coerced into doing, but not into thinking. Making people *think* is different from making people *do* and requires altogether another type of skill, based on a different management posture. *Making people to make products* is a profound commitment not to use people but to develop them.

Having the right attitude is not enough. You also need to learn *how* to make people think. No manager can control the way people think, but they can apply a healthy pressure and provide mindful coaching. In this case, not only do we want employees to develop a continuous improvement mindset, but we also want them to solve problems in the right way: by identifying root causes and making sure the problem will not come back, without investing in plug-and-play solutions. Finally, the aim of managing by problem solving is not just to think about problems, but to improve processes in such a way that problems don’t

come back – so there’s quite a lot of doing involved. As Toyota veteran Art Smalley phrases it, making people to make things is about learning to *see*, learning to *think* and learning to *do*.

In fact, most of the practice of managing by problem solving is about learning to *think* by *doing*! Reasoning doesn’t happen in a vacuum – it’s an interaction with the material situation and the people involved in it. Recognizing this, rather than ask people to reflect in their ivory tower, managing by problem solving is about carrying out activities which will clarify the situation and make the problem stand out more clearly. Typically, traditional managers faced with a problem will lock themselves in a meeting room with their staff, pull all the available data on the issue from the reporting systems and try to piece together an understanding of the situation which will shed some light on the problem. From this mental model, they will derive a theoretical solution, which they will then ask operational people to “apply”, with varying degrees of success. As a rule, things go wrong at the “implementation” stage, and evolve into the endless debate of solutions versus application. Is there something wrong with the solution? Or is it a problem of execution? And so on, and so forth. This kind of thinking has plagued the re-engineering movement, for instance, where processes were redesigned by management and consultants in war rooms and then “applied” to the shop floor, where all hell broke loose. To a large extent many IT solutions continue to reflect this kind of thinking, and repeatedly disappoint in their return on investment. Frontline operators and supervisors blame the system, consultants and senior managers blame the inflexibility and resistance to change of the frontline staff – old story.

Lean thinking analysis takes a very different path. First the analysis happens materially, on the shop floor, in the physical world. Many small systems are locally created to better understand the situation and cause and effect. To visualize an overproduction problem, a yellow line can be painted on the floor to show when a local inventory is overflowing, and facts can be gathered accordingly in terms of what kinds of situations make this happen. This sort of “material thinking” is ubiquitous in lean and applies to all sorts of subjects. Poka-yokes will either stop bad parts in the process or signal the operator that something is wrong. Indeed the whole TPS pillar of jidoka is devoted to mechanical (autonomation) and human (andon) systems made to highlight anomalies so that operators and management can come running and “get the facts” from the horse’s mouth, so to speak. TPS tradition has Ohno asking engineers to stand hours at a time in a chalk circle in front of a machine to learn to see and spot potential abnormalities. The thinking process being different, so are the solutions. Whereas the traditional path tends to lead towards “large” solutions, either as new

investments or policies, lean analysis is more conducive to local, hyper-specific “kaizen” type solutions. The problem is not fixed globally, but instead is attacked by many very local adjustments. What then tends to happen is that this learning is capitalized and reemployed at conception at a much larger level.

If developing people is the secret to Toyota’s success, how does it go about it? The answer, again, is pretty explicit in Toyota’s management style. People are developed by solving problems, following the rigorous method of Plan-Do-Check-Act taught by Dr. Deming all these years ago. Countless stories are told within Toyota about how problems are really valued opportunities for growth, yet these anecdotes are generally taken with healthy cynicism in western cultures, where being associated with a problem is the best way to get shot as the messenger of bad news. Yet, by all accounts, the “Problems first” permeates all aspects of Toyota’s culture, from getting graduate engineers to solve problems for one to two years before actually designing a part, to hiring operators for their problem-solving skills.

In dealing with its European suppliers, Toyota currently requests from them three practical things: *bad news first, talk immediately and plan safety stock, people management*. Indeed, the “leaner” operations are, the more damaging any small problem can be. As Toyota explains 99.5% delivery sounds good, but it’s really 5000 DPM (Misdelsiveries Per Million) and hence a considerable business interruption risk.

From observing many such situations, we can formulate seven steps to “lean management”:

1. *go to the real place and agree on what the problem is*
2. *find pragmatic ways to visualize the problem*
3. *measure locally the gap in performance between what is and what should be*
4. *standardize current practice and compare with best known practice*
5. *train staff to basic analysis methods*
6. *run quick experiments, check results rigorously and reflect*
7. *draw the right conclusions for the entire system of operation*

These seven steps are consistent with both the “Toyota Way” (Challenge, Go and See, Kaizen, Respect and Teamwork) and Dr. Deming’s Plan-Do-Check-Act cycle, but we’d like to insist on the fact that beyond the intellectual consistency of problem-solving, these steps are real *management* steps. Not only are they a specific way of facing business situations, but also one needs to get people to perform them well, which, in real life, can be a serious

struggle because staff used to business as usual methods find it hard to do so, don't see the sense or the benefit and often resent the "extra work" before they see the increase of performance. On the other hand, supplier teams that have adopted this way of working in their every day practice progressively discover the benefit of what Toyota calls "respect"(mutual trust with an expectation of mutual responsibility): making sure staff members can be successful in doing their job. To clarify each of these steps, we shall illustrate them with different supplier interactions.

### **1. Go to the real place and agree on what the problem is**

Usually, when an automaker has a problem with a supplier, the supplier's management can be expected to be called at headquarters to present the action plan they intend to implement in order to improve things. By contrast, when Toyota has an issue with a supplier, it will send a team of its engineers to the supplier's site, observe the process for a couple of days and then typically explain to the supplier how its misguided use of its own equipment is creating the problem in the first place. In several cases, this embarrassing situation can lead to heated discussions because supplier engineers have not found the time to stay and observe the delinquent process with their Toyota counterparts – and so have not seen the "real facts" and disagree on the problems. One supplier, for instance, asked for Toyota's help with an out-of-control paint process. Toyota's paint expert asked for a study group to be formed, and came once a week to the plant. In the plant, the expert expected the group to be waiting for him and would not do more than take the group through the paint facility, point to a number of painting problems, debate about which problem needed to be solved next and gave "homework" for the group to solve for next week – never making any actual suggestions. Members of the study group soon complained to their management that Toyota's expert was not helping them to improve their paint process, and soon stopped coming to the weekly sessions. In this case, the gap in expectations was painfully obvious. The Toyota expert expected the supplier technicians to learn by solving their problems one at a time, and his job was to orient them on the right problems, whereas the supplier paint group expected from Toyota a set of solutions which they would implement at their own choosing through an action plan. "The workplace is a great teacher," one Toyota veteran said once in an overlong powerpoint presentation – but a teacher of what? The first step in lean management is not to discuss any situation in the meeting room, but to go to the real place, look at the real facts, and agree on what the main problem is to make the correct decisions and achieve the overall goal.

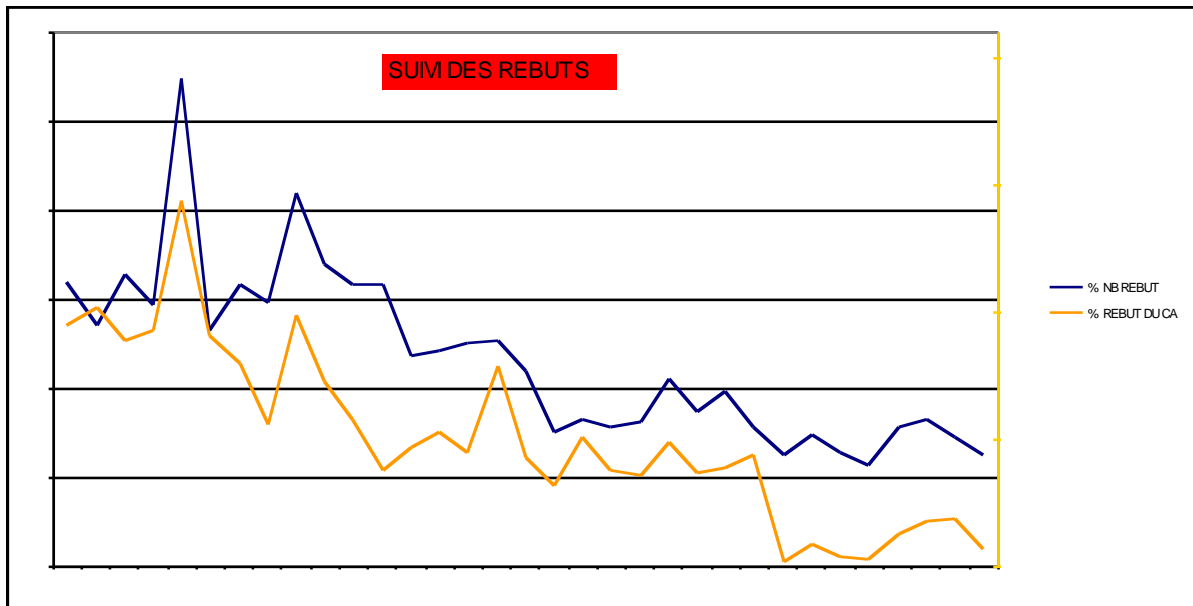


There is nothing obvious in adopting a “problems first” mentality. It is uncomfortable in many ways. First, no one wants to be associated with a problem – in any company, being close to the problem is the best way to be the first to be blamed. Secondly, most engineers are trained to solve known problems with a known method – their intelligence is rated on how quickly and how well they apply the method to get to the correct answer. In fact, in business, the very notion of “methodology” stems from the idea that experts can write down the rules for the proper method, such as “six sigma” methodology, and people are often evaluated on how good they are at implementing it, rather than on their actual sustainable results. Not so at Toyota. “There is no such thing as expertise in lean, only experience.” Understanding the problem is a far more difficult skill in real life than simply running a method. More often than not, most conflicts in companies are born from confrontation of solutions looking for problems.

## **2. Find pragmatic ways to visualize the problem**

Visualizing problems in real time (not through reports or numbers) is unique to the lean approach. A key part of developing people is to make sure they understand the difference between causes and effects and the causal relationship. In many practical situations experience shows that this is very hard, which leads to confusion and belief-based behavior rather than rational analysis. In fact, in real life situations, it is often hard to understand what goes on unless one finds a clever way to visualize the problems. In most cases, managers are blind and can only see whether its working well or not overall through managing-by-numbers.

Another firm was supplying Toyota with plastic injection parts, with a high number of defective parts. The first step was of course to institute quality firewalls (100% check) to stop delivering bad parts, but the result was a cost of non-quality superior to the plant’s margin. The plant manager tried to tackle the large number of defective parts spewing out of his twenty plastic injection presses by instituting a weekly quality meeting with his function heads: quality, production, engineering, maintenance, etc. and they would sift through all the quality data, analyzing which type of defects appeared on which products from which types of presses with which types of mold. In real terms, this is a complex problems since the quality defect on a plastic aspect part can come from the press itself, the mold, the plastic grade used, operator manipulation and containers, etc. For months and months, the team



drew pareto charts, ishikawa analysis, and so on and cut at the problems in all ways, but beyond the initial gains of the low-hanging fruit the plant’s overall defect rate remained frustratingly high. The plant then tried to work with various consultants who could not find any fault with how they analyzed the problems, but could not help them improve internal quality either.

Throughout this period, Toyota’s suggestion was to use “red bins”: red containers in front of each press in order to visualize the quality issues at the press rather than through the central reporting system. The plant manager did this, but without much conviction or understanding, and never manage to follow up on the suggestion that non-quality should be that his management team should spend time discussing the non-conform parts in the red bins with operators as they *appeared*. At about the same time, a sister plant in the division took the “red bin” approach to heart: it set up a red container next to each machine and asked the operators to do two things when they spotted a defect: first to ask their immediate manager to have a look at the part, and to jointly decide to place it in the red bin as non-conform. The parts in the red bins are examined in two different ways:

1. at fixed hour every shift (10:00, 16:00, 03:00) a small frontline management team (supervisor, quality, engineering, maintenance) takes forty minutes to review every red bin, look at the parts, and take immediate corrective action.
2. At the end of every shift, the red bins are emptied and their content analyzed by quality in terms of paretos of types of defects

With this simple (but difficult) action, this plant dramatically reduced its scrap percentage, as well as non-quality costs in a few months:

In the first months of the process, engineers focused on solving all the know problems causing scraps (164 planned actions in the first month, 124 done, 41% realized by the supervisors themselves). Then they started hitting problems where the cause was not

obvious any more. At this stage, rather than take the issues back to meeting rooms, with a few simple flip charts, they conducted regular meetings on the shop floor to discuss with operators and tool setters the possible causes of the defects, and conducted root cause analyses on the shop floor with the people really involved. Their conclusion from this experiment was that witnessing concerns firsthand led to a completely different understanding of the problems, and enabled them to tackle issues one by one, and really solve them rather than apply superficial solutions as they had been doing in the past.

To some extent, it can be argued that the entire pull system of production is a way to visualize delivery problems: by delivering a little of everything frequently, one immediately *sees* the delivery failures, and so can react. As Toyota has been saying for decades, “lowering the water in the river (stocks) makes the rocks appear (visualizing problems). Similarly, producing in one-piece flow (as opposed to say, three piece flow) is the only way to truly visualize imbalances between operator cycles, and so wasteful operations. Clearly, visualizing problems is not enough: they still need to be resolved. Many lean implementers have been disappointed to find out that installing a pull system does not improve performance per se. Performance moves up when the management reacts immediately to all the issues which the pull system reveals. On the other side, the best way to understand a problem is to be there, witnessing what the process is doing wrong real-time, rather than hearing about it after the fact. Certainly, as with a police investigation, the quicker you are on the scene, the higher the chances of solving the mystery.

Visualizing problems requires probably the most radical departure from classical management. “Problems first” is hard enough, but, after all, that is what managing-by-numbers is about. Although it unfortunately can transform into “meet the numbers and hide problems”, the original intention of financial reporting is to highlight the trouble areas and go and fix them. Visualizing problems, however, demands that managers accept that an operator should not be left alone with a problem, and create the kind of management structure which can react at every operator concern. Traditional management systems are built around centralized operation control: the computer has captors everywhere, chews the data up, and tells you which aspects of your business need to be focused on. Brilliant decision-making is then needed, and bold implementation required. The lean approach is dramatically different: it’s a decentralized operation control system. Lean managers are expected to constantly walk the workplace, discuss with operators about how they understand their process, what problems they’re having and how they could improve their

own situations. Shifting a management team from one approach to the other is probably the hardest challenge one can encounter in lean transformation. For instance, lean will imbed in a plant if the plant manager learns to spend at least half her time on the shop floor looking at how her people use the equipment to make good parts, one-by-one, in sequence, and discussing ways to solve problems with them. To do so involves a radical rethinking of management's job – which most lean would-be adopters find daunting.

On the upside, reacting to every value-added level problem is also a great opportunity to train operators at doing their job well. At the end of the day, the management structure is paid by the work done by frontline people, part after part, customer after customer, file after file. The decentralized focus of lean is also the key to better understanding value-adding processes (and their implicit waste) and the importance of training, re-training and developing frontline staff. Again, the result of doing so will be far more standardized process than any centralized procedures or decisions can ever achieve.

### **3. Measure locally the gap in performance between what is and what should be**

A caricature of classical management could be: concentrate assets, run them into the ground, replace them with new investment when non-performance becomes too costly. Lean is, well, lean not simply because of focusing on value-added activities and stopping non-value-added work, but also because investment is reserved for new activities. In all other cases, the performance gap has to be reduced by drawing more (essentially capacity, flexibility and cost of operation) out of existing equipment and shunning expensive “plug-and-play” solutions. To be able to do so, one needs to understand the running of assets in much greater detail, and indeed, in lean, a problem is defined as the gap between current performance and required performance.

Toyota offered additional volume for pressed parts to a supplier, who was already running at full capacity. The supplier immediately argued for investment in an additional press, but Toyota's lean expert first had the supplier measure exactly current press utilization. Press by press measure gave a very different picture: several presses were under-utilized hours at a time. If, somehow, the additional workload was spread evenly across these unutilized times, the increase in volume could be absorbed by the plant without adding capital expenditure. From the measures, it appeared that the plant worked with long production runs of several shifts for each part, in order to minimize the cost of tool change-over. Unused press time

corresponded to a few hours a day on each press, and was far too short to a “normal” production batch. Over a period of months, Toyota’s expert led the plant to reduce its batch size by doing more change-overs, and not losing more time on change-overs by reducing change over-time, until the previously unused time could be filled with short batches. This, in turn liberated the needed capacity without extra investment.

However, this strenuous work also uncovered that the presses were stopped far more often than was previously perceived by the management. Again, a detailed measure of the causes of non-OEU led to stabilization actions, which increased overall press utilization. Now, all of this was incredibly hard work, but there was nothing in this effort that the supplier *did not know how to do*. What happened was that centrally calculated ratios had convinced its management to solve the problem of increased demand in a traditional decision of added investment. Measuring actual press usage at press level, and identifying the performance gap press by press showed that a “lean” solution could be envisaged: increased volume through hard work rather than further investment. In effect, the plants’ engineers, technicians and operators learned how to run their equipment more effectively. So the real investment was in developing the people further, rather than giving them one more piece of equipment to operate badly.

Measuring the local gap between current performance and best performance (either the best day, best hour or the best seen elsewhere) almost invariably leads to a different, more detailed understanding of the problem, and from that a different way into solving it. Almost the very first action in any lean implementation is setting up production analysis boards at each cell, where operators track hourly the gap between what they’ve achieved and their target (defined as the best they can achieve in an hour of uninterrupted work), and explaining the causes for this gap. Lean is a decentralized operation control system, and measures are equally decentralized. Such systems have led Toyota to develop over the years different kinds of production control systems. For instance, any Toyota plant has a large electronic display showing through the day the shift’s target, current situation and the gap (which will be resolved at the end of the day by overtime: the plan *must* be achieved). The same electronic board also lights up with the station number when operators have a doubt and call management for help by pulling on a help button or chord – what is called an “andon” system. If the problem cannot be solved within a fixed time, the entire line will stop – and so the gap with target will accrue. Toyota conducts detailed analysis of the “andon” chord pulls to understand the differences between shifts and stations, to see where and who

has the most problems at a very detailed level. Although this level of measure is done by computer, and not just by hand at the workstation, the idea remains the same: measure the local performance gap between where there are more andon chord and where there are less, and try to understand the difference.

From a management point of view, measuring the local performance gap demands, again, quite a radical shift in practice, because managers now how to persuade teams to track their own performance and highlight their difficulties through the day. The benefit of such effort is to involve operators in wanting to achieve their team's objectives and to develop their understanding of their own situations – but it requires that management be constantly interested and available. Production analysis boards need to be looked at least once every hour by the supervisor and once a day by production management for operators to continue to see the sense in writing them up. Tracking local performance is the key to a more detailed understanding of problems, and from then on, to “lean” rather than high investment solutions, but it requires shifting the management job away from status meetings, reporting and other office tasks to being at the workplace discussing work problems with frontline staff.

#### **4. Standardize current practice and compare with best known practice**

Suppliers to Toyota are often surprised when the company's lean experts ask them to first apply whatever method they have consistently rather than immediately asking them to implement lean tools such as pull systems or andon chords. After a visit to a Toyota supplier plant in Japan where, with a similar activity, the ratio of operators was seen to be one to three, one seating factory tried to copy the Japanese operation and organize seat assembly as a production line. Operators had traditionally build entire seats from scratch, each in their own way, which was felt to be the cause of the gap between actual seats per person conditions and what the Japanese seating plant was able to do. Consequently, engineers came in, studied the seat assembly operations, devised an assembly sequence, divided the operations by customer demand and created a balanced line with operators organized in a line and each doing a part of the seat. Their calculations were correct, but unfortunately, the operators adamantly refused to change their working habits, and claimed that the line method would be not only dehumanizing, but would also create many quality problems as one person would lose the responsibility of doing one seat well.

When the Toyota expert walked onto the scene, he surprised the engineers by berating them for their wrong-headedness. The first thing to do, he suggested, was to work with each operator to standardize their own method: make each operator build seats consistently. The second then was then to get the operators to compare their own standard methods amongst each other, and try to figure out the causes of the differences in quality and productivity from one person to the next. Many weeks later, the expert discussed long and hard with the operators to show them the benefits of working on a line, such as no interruptions due to missing materials because components could be brought regularly with a small train, and also the possibility of helping each other if the operator before or after ran into trouble. In the end, the operators themselves contributed significantly to the design of the seating line, and the productivity gain was obtained with a quality increase, through the development of the people.

Once the gap in performance is measured and accepted, people need to understand in detail what they currently do, and why this creates a performance shortfall. The third step in developing people is therefore not to immediately show them a better way, but first to make them understand their current method in detail, and so to compare it to best practice so that they themselves can figure out the problems in what they are currently doing. Again, the fundamental insight rests on the fact that we are natural problem solvers: once we've understood the problem, our mind will flow seamlessly to adopting a solution. On the contrary, however, when a solution is forced onto us where we *do not see* a problem, chances are we will fight tooth and nail against it – no matter how clever the new approach really is.

A side benefit of using standardization in this sense of “reference” rather than rule or procedure is that processes across the organization will strive to stick to standard rather than deviate from it without having to constantly reinforce “rules” through discipline and control. The main question here is how to both encourage people to participate in running and improving their workspace while at the same time making sure they follow standardized work methods. “Autonomy” in lean means that when you've got your back turned, employees follow standards rather than improvise. For instance, on the shop floor, lean practice encourages the use of tape for identification of containers and tools rather than paint. This doesn't seem to make much sense, because tape falls off far more quickly than paint peels, and the area needs to be identified again by putting the tape back. But every time the tape falls off, the operators have to think about movements, practicality, waiting time and the tape will not be exactly as it was before. Containers will be a bit closer,

machines will have been moved together, access to a frequent panel for maintenance will have been cleared, etc. So although at one given point in time the area is very standardized, with everything in a given place and all abnormalities seen at a glance, over time the area is in constant change. Standardization and kaizen are two sides of the same coin: without standardization, people can't learn, without constant improvement, they can't progress.

## **5. Train staff to basic analysis methods**

Obviously, visualizing problems is only half the issue: problems need to be resolved as well, and in a lean way – which means by using one's ideas rather than one's money. Chances are that if people knew how to solve all their problems beforehand, they would have done so already. Indeed, most operational problems are difficult to solve because it is often hard to distinguish cause and effect, and so breaking down the question into components parts for in-depth analysis is often complex. For instance, in the case of increasing press capacity without increasing investment, change-over time became a make-or-break issue. To help the plant reduce the time of its tool change-overs, the Toyota expert taught them to use the proper methodology, which is to separate internal (when the machine is stop) from external (all the preparation that can be done while the machine is still operating) to reorganize tasks accordingly.

Over the years, Toyota has developed a number of basic analysis methods to deal with specific subjects. Most of these techniques are based on the Plan-Do-Check-Act cycle, but are also specific to the type of problem at hand. More generally, Toyota has also developed a “A3” problem-solving approach to tackle the most complex problems that do not fit any known form.

The whole point of these lean analysis tools is not just to “treat” problems, but to actually resolve them: to make sure the problem is fundamentally solved and does not appear again. To do so, the analysis techniques are about identifying root cause through a thorough examination of the question. The most basic analysis method, and also the hardest to master, is the “5 why?” approach: asking why until the root cause appears. Although extremely simple, this technique also requires depth of experience and a profound technical understanding of the situation. If not, the “5 why?” can lead to endless questions all over the place, without getting any closer to the root cause.



Asking “why?” is in itself a management act, not simply intellectual curiosity. In truth asking “why?” repeatedly, beyond the point of embarrassment where people actually don’t know the answer, requires in itself a strong stand. In general, most of us prefer to side-step any issue if we can, to go around the problem. Toyota analysis methods are all about tackling problems head on, and resolving them. In fact, one senior Toyota executive once summed up its management method as: “go and see, ask why?, show respect.”

## **6. Run quick experiments, check results rigorously and reflect**

The previous discussion should not give the impression that lean management is over-analytical: it is not. Going to see at the workplace, coming up with clever, simple systems for visualizing problems (such as simply drawing tape around containers), measuring local performance and searching for root cause are all *actions*. Clearly, analysis is a more reflective state, but, again, Toyota experts rarely let that phase go on for too long. Soon enough, the supplier’s engineers come up with working hypothesis, and the answer is invariably “try it!”

One supplier had implemented a successful “just-in-time” pull system: stocks were no longer held upstream of the process but in a supermarket downstream of the machines and cells. The downstream process helped itself in the supermarket lines of product through a kanban card system, and the cells would only produce what was being pulled out of the supermarket, in the sequence in which it was consumed. All of this worked pretty well, but the work-in-process stock remained quite high, and the Toyota consultant felt that problems were no longer being resolved. The supplier lean team had been busy for several weeks trying to calculate and recalculate the exact size of the supply kanban loop to “optimize” the system, when the consultant peremptorily announced they should be halving batch size, and reducing by 50% the stock held in the supermarket. The supplier team resisted and argued for weeks, but the Toyota expert held firm, and in the end they just did it – encountered some problems, solved them, and continued to progress.

There are very few operational experiments which cannot be reversed quickly, and hence, a bias to action is perfectly reasonable in routine processes. Analyzing is one thing, procrastinating another. However, to be able to push experiments through management also has to be very rigorous with staying there and checking the results of the experiment. In the previous case what happened is that when management finally gave in to the Toyota consultant’s demand, it told its people to “cut batch size by half” and, in typical management

fashion moved on to deal with another burning topic. Not so the Toyota consultant. When the experiment actually occurred, he made sure the lean team and the area management actually stayed there long enough to understand what exactly was happening.

Typically, there are many lean tools in the box of tricks to make an operation run more efficiently in a workshop or kaizen event situation, and many managers interpret this as an “improvement” – only to be disappointed when the results don’t show up at budget level. This is an illusion. Workshops and experiments only demonstrate what kind of performance could be achieved if a number of day-to-day problems were resolved, but are in no way stable. The hard work still remains to be done! Toyota has the double difficulty with its suppliers in one, moving them quicker to actual experimentation, and second, making sure they stay interested during the check-and-reflect period, to solve the issues and stabilize the line.

PDCA management, and more specifically Check and Act management imply a radical transformation of managerial behavior. First, problems have to be tackled one at a time, which involves agreeing with the persons or teams on which is the next problem to deal with, as opposed to producing pages and pages of action plans where everything needs to be done at once – and never is. Secondly, managers need to remain close to people as they conduct the experiments. They can no longer simply spread actions around, or give assignments, and then move on to the next subject and disappear. Because Check and Act is both counterintuitive and difficult, management presence is needed at this stage, to make sure that people are really checking, and drawing the right conclusions from their experiments: in effect, to make sure that staff are learning!

## **7. Draw the right conclusions for the entire system of operation**

One of the authors was visiting a factory with the plant manager and stopped at one production cell where one shift was clearly doing better than the other two, both quality and productivity wise. Puzzled, we asked the team leader of the better performing shift how she explained the success of this cell. “Easy,” she answered – “I just make sure I work with the same people every day and I stop them from moving operators around.” Interestingly, this is a core Toyota tenet about how to run operations: stabilize operators in teams, so that they will know an area intimately, and in essence, a pre-requisite to making people before making products. Questioned about why he didn’t expand this to the rest of the plant (in order to get

the productivity and quality windfall), the plant manager explained: “You don’t understand. This plant has a lot of volume and mix variation. If I stabilize people in the cells, I lose all labor flexibility.” In essence, the plant manager is accepting a quality and productivity shortfall to avoid facing the fundamental problem of how you better schedule production whilst keeping people in stable teams and cells.

*Act*, or *Adjust*, is a natural conclusion from the *Check*, and where the true power of management by problem solving lies. First, *Adjust* is about challenging whether the observed results are up to what was expected, and if not, understand why and what can be done to get to the objectives. Second, *Act* means drawing the right conclusions from the experiment, and changing the way the system is organized to make sure the problem will stay solved, and to think about where else this learning could apply: *what did we learn, and what conclusions do we draw from this experiment?* Lean management is about learning and constantly creating working knowledge as a by-product of any management act. This in turn, *builds the competence* of the people and *standardizes the processes* on what works as employees start to share clear models of dos and don’t in specific situations. Managing by problem solving creates knowledge at management level because managers need to have a precise understanding of what their processes should do and not do in order to have the right conversations with their employees about which problems to solve – which creates a strong incentive for managers to get involved in the details of value-added work. Managing by problem solving also creates knowledge at employee level because solving specific value-added level problems will increase the level of competence of frontline workers, as well as their mastery of their own processes. Finally, this form of management also produces a different kind of organizational knowledge in strengthening the relationship between management and workers as they face problems together. This, in turn, builds up the intellectual capital of the firm and becomes the kind of competitive edge impossible to copy. As Toyota’s President repeatedly points out, this, however, is not easy: “at the start, the line keeps stopping, for example “ he illustrates, “Even when you see it, it is difficult to understand.” For many managers, it means confronting deep assumptions about their own management styles and changing their mind about habitual behaviors and attitudes.

Practiced assiduously, making people before making products leads to a different interpretation of traditional functional hierarchies. Firstly, people are now seen as assets that continuously appreciate if taken care of, rather than costs on the P&L. A lean firm is serious about putting customers and associates first when taking decisions because of the huge

investment in developing relationships with the former, and developing abilities in the latter. Secondly, jobs are reinterpreted differently, with responsibilities seen separately from authority. In essence, any one can be given, as part of one's development plan, responsibility of a problem to solve, even if the problem is above one's pay grade. Solving problem without authority means getting to talk to senior people and having to convince a wide spectrum of colleagues, which in turn is a great way to develop relationship and make oneself known out of one's narrow job area.

Ultimately, making people before making products redefines traditional notions of leadership. Leadership is usually seen as having a grand vision, taking bold decisions, and convincing followers to make it so. The lean approach to leadership is wholly different. It's about agreeing on what the real challenges are and working at them together. It's no less bold, nor less decisive – it's something else. Soichiro Toyoda summed it up in the "Three Cs", Creativity, Challenge, and Courage: "The third C is for courage. It is most important to take the relevant factors in all situations into careful, close consideration, and to have the courage to make clear decisions and carry them out boldly. The more uncertain the future is, the more important it is to have this courage."<sup>12</sup> According to John Shook, the leader's role at Toyota is first to get each person to solve problems and improve his or her role and, second, to make sure that each person's job is aligned to provide value for the company and prosperity for the customer.<sup>13</sup> Realizing this, however, means fundamentally moving away from looking for plug-in solutions and worrying daily about:

- Do people understand the processes they're in?
- Are they focusing on the right problems?
- Are they solving problems the right way?

How many people are under your responsibility? Are you using all their brains, or only the few brains around you and lots of hands? The determination to use every brain at its fullest ability and to develop every person through problem-solving is, we believe, the core difference between Toyota's approach of management and the Ford's mass production or Sloan's corporation. In today's resource-constrained environment, this is a skill all business badly need to acquire in order to collectively face the challenges of this brave new century.

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<sup>12</sup> [http://www.toyota.co.jp/en/vision/traditions/nov\\_dec\\_03.html](http://www.toyota.co.jp/en/vision/traditions/nov_dec_03.html)