

The Lean Difference: Building a High Performance Enterprise

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In 1979 I set out with a number of colleagues at MIT to understand why the best Japanese firms seemed to be so much better at making things. At the time, the favored theories were low factor costs („they’ve got an undervalued currency and low wages“), Japan, Inc. („they cheat“), and culture („they work harder“). We thought otherwise. Indeed, we believed that there had been a fundamental shift in the philosophy and organization of manufacture – a shift moving the world from the age of mass production into a new era. However, it was hard to be absolutely sure that we were right. Convincing others was even harder.

We decided to conduct an unprecedented worldwide benchmarking exercise in one massive industry (motor vehicles) to see how firms compared in terms of productivity quality, quickness-to-market, etc., and then to look for the fundamental causes of differences. This turned out to be a tremendous challenge. It required not one but two research projects. Dozens of researchers from a dozen countries worked for more than a decade before we got the answer.

What did we find? Quite simply that by the early 1980s, the best firms – all of which were Japanese, led by Toyota – had established an extraordinary gap between themselves and their Western rivals on every performance dimension. Specifically, they could perform a set of standard manufacturing operations on a product of given specification (e.g., a subcompact automobile with a given level of optional equipment) using a given level of automation with:

- Half the hours of human effort in the factory (direct, indirect, and technical; hourly and managerial)
- Half to one-third of the delivered defects
- Half to two-thirds of the development time
- Half the hours of engineering effort – to develop a product that was more manufacturable
- One-tenth (and often much less) of the in-process inventories
- One-quarter of the finished-unit inventories (in Japan only, due to the „aggressive“ selling system)
- Half the factory space per unit of output
- One-quarter of the life-of-the-product production volume

In addition, the best Japanese firms were able to pull newly available technologies into saleable products much more quickly than Western firms – without encountering reliability problems.

Because the production system of these leading firms needs less of everything – time, human effort, bricks and mortar, inventories – and turns out products with fewer defects in smaller production volumes, we decided to call it lean.

Looking for the Causes

These differences in performances are startling. It is not unusual in business to find a competitor substantially ahead on one dimension or another, but a dramatic lead on every competitive dimension is a sign of a profound breakthrough into a new way of doing things. What are the fundamental causes of the performance gap between the best Japanese firms and most Western firms?

We concluded that the difference traces to a new philosophy of manufacture, coupled with new organizational forms to support the new philosophy. Once these are in place, a number of specific techniques (including JIT, quality circles, U-shaped machine layouts, simultaneous engineering, and sophisticated supplier audits) produce substantial competitive advantage.

The lean philosophy might be summarized as follows:

- The product is the heart of the enterprise.
- A perfect product is attainable.
- Consumers can have exactly what they want without a large cost penalty.
- All buffers – extra time, extra space, inventories of any sort, extra people – are waste (*muda*).
- Improvement is always both possible and necessary, through an incremental approach (*kaizen*).

- A career consists of solving increasingly difficult problems in a multiskilled group.
- All relationships in manufacture – employee/ employer, assembler/supplier, assembler/ distributor, producer/customer – must be long-term, aiming toward „zero defections.“
- The „enterprise“ extends in a seamless network from the beginning of the activity stream to the end, even when it crosses organizational boundaries.

Note that a number of these precepts are clearly impossible – even Toyota does not make perfect automobiles, nor can it customize every product to each consumer’s desires, nor does it continue to work with every supplier. *Yet* believing that these goals can be attained eventually through hard work and continuous improvement sends the lean producer down a fundamentally different path from the mass producer who believes in „good enough“ – an acceptable level of defects, a modest amount of product variety; and retention of suppliers only as long as they are the lowest bidder.

However, the lean producer would not get very far down this path without an organization to match its philosophy. All large organizations performing tasks that require very different skills have a tendency toward functional sclerosis. The key organizational innovations in the leading Japanese firms involve the perfection of „group“ work of four different types to counterbalance this tendency. Successfully introducing these four types of group work also requires providing employees with a new understanding of a career in the enterprise. The four types of group work are factory product development, supply chain, and distribution and service.

Factory Group Work. Work in the factory must be reoriented to the primary work group. If this group incorporates the „indirect“ functions previously assigned to supervisory and technical staffs, many of these tasks and many errors simply disappear.

Similarly, if the group is given the means to continuously improve the process, performance does actually improve. However, to sustain improvement, the best lean producers make large investments in promoting from within and in continually upgrading the skills of every worker.

Product Development Group Work. Product development groups with strong leaders and continuous involvement from all relevant activities (including market assessment, component supply; and distribution/ service) must be given a central role in the enterprise. This does not mean diluting technical functions or removing the development group from the larger enterprise (the familiar „skunkworks“ ploy), but rather assigning employees with key technical know-how to development groups for the life of the effort – and evaluating their performance in terms of their contribution to the group process, as well as their know-how. Career planning is critical here, to retain employees and keep their skills at the cutting edge while keeping them focused on the critical task – the product itself.

Supply Chain Group Work. The assembler firm must develop a new „group“ approach to its key suppliers, who must in turn develop their own supplier groups. Rather than coordinating the supply chain through bureaucratic rules (vertical integration) or the market (arm’s-length bidding), the lean producer develops a „shared destiny“ with a core group of suppliers. This core group takes on the bulk of engineering activities for component systems while farming out the manufacture of discrete parts to their own supplier groups. Techniques are critical here – target pricing, value engineering, and value analysis – but these can work only when the assembler/supplier and supplier/subcontractor relationships give all parties incentives to share rather than hoard information. The personnel system plays a vital role as well in facilitating the transfer of key personnel at various points in their careers between assemblers and suppliers – organizations that may be legally independent, but must be operationally integrated.

Distribution and Service Group Work. Assembler firms must develop another type of group approach by sharing a destiny with a small team of dedicated distributors whose internal sales teams are also organized on a group basis. The objective must be to establish a lasting relationship with each customer in order to create a direct information conduit to product development and some ability to adjust short-term demand to the capacity of the manufacturing system. (Toyota calls this process „aggressive selling.“)

Once the lean organization is in place for these four critical functions – production operations, product development, supply chain management, and customer relations – it is much easier to deploy the full array of lean techniques, such as JIT, quality circles, and simultaneous engineering. Without a lean philosophy and organization, lean techniques either will be impossible to implement or will deliver disappointing results (as many Western firms discovered in the 1980s).

Where Does the World Stand Today?

As I noted earlier, we found that by the early 1980s – when we began benchmarking – the leading Japanese firms had a commanding lead over all Western firms. What has happened since that time? In particular, is there a natural tendency toward convergence as Western firms try harder and Japanese firms are forced to move their production systems off-shore?

We found three trends. First, the gap between the best Japanese firms and the also-rans is widening and in some cases is very wide. For example, the most adept Japanese firm needed only half the factory effort required by the least adept to perform our standard manufacturing operations on a standard product using the same level of automation. Thus, „Japanese“ does not automatically equal „lean,“ and it is likely that a number of Japanese firms will fall by the wayside in the next few years.

Second, the leading Japanese firms hardly missed a beat in transferring their manufacturing operations to North America, and soon to Europe. Honda, for example, achieves the same productivity and product quality in Ohio as in Japan. Nothing confines the application of leanness to one country.

Third, we found that the best Western automotive firms – all of them American, currently – have made impressive efforts to close the gap with the leading Japanese firms. Ford, for example, has dramatically improved its manufacturing operations to a level slightly better than the Japanese average in Japan, and Chrysler is showing evidence of a remarkable transformation of its product development process. However, we have found no Western firm able to close the gap across the board in all four critical functions. The leading Japanese firms are still the leaders and are marching from victory to victory in world competition.

Can Lean Production Work for You?

Because we wanted to understand fully the specifics of the Japanese/Western performance gap, we concentrated on a single industry, albeit a very large one. It is natural to ask whether our striking findings about the auto industry are relevant to other manufacturing industries and to services as well.

My answer is that the advantages of lean production are entirely philosophical and organizational. They do not depend on specific products or technologies. Any industry – manufacturing, process, or service – that produces a complex product has many employees with a wide range of skills, many suppliers, and a complex distribution process. It is likely to have many of the same problems as the automotive industry – and to gain the same benefits from getting lean.

Getting Lean

If even the leanest Western firms are still behind, what must they do to catch up?

First, the experience of the 1980s tells us very clearly what won't work:

- When discrete techniques (such as JIT, simultaneous engineering, supplier quality audits) are applied to enterprises with neither the philosophy nor the organization to accept them, they fail to produce results. The same is true of process automation or automated information systems. Philosophy and organization must precede technique.
- Piecemeal improvements in parts of a system are a waste of time. Firms can't fix their factories by implementing *kaizen* activities if the product engineers and the supplier group are not organized to support them. Production must be conceived as a total enterprise cutting across traditional functional and organization boundaries.

If these lessons are learned, the necessary elements of a catch-up strategy are simple:

- A sense of crisis shared by the whole enterprise
- A coherent, comprehensive model of a lean enterprise to copy
- Creative adaptations of the original model, often developed with the aid of outside advisers

The sense of crisis is necessary because the scale of change in both philosophy and organization to move from mass production to lean is vast. A crisis – which can be defined as the point when the crew starts thinking about how to save the ship rather than how to get promoted to captain – is essential; but it is for naught without a clear model of what to do.

The discovery of a model to copy often begins with a benchmarking exercise in the midst of a crisis. For example, in the depths of the 1980-82 auto depression, senior Ford executives and union leaders spent months at Mazda, Ford's Japanese affiliate, trying to understand why Ford had such a large disadvantage in terms of both cost and delivered

defects. Similarly, in the late 1980s, as Chrysler found itself stuck with low selling prices in every segment of the auto market, it undertook a benchmarking exercise to learn how Honda consistently achieved top-of-the-segment prices – and more manufacturable designs as well. However, note that Ford and Chrysler went far beyond simply benchmarking performance to zero in on the ultimate causes of the difference – which turned out to be philosophical and organizational.

Finally, with a clear model in hand, the firm is ready to take the hardest step in getting lean: creatively adapting someone else's version of lean production to the unique history and circumstances of the enterprise. Ford, for example, made little attempt to implement formal work groups or highly elaborate problem solving methods at the outset. Rather, it dealt with supplier quality problems and eliminated many indirect tasks by reassigning them to the primary work force. Chrysler totally reorganized its product development process into four product teams (one each for large and small cars, pickups, and vans), but in a way that resembled Honda's „large project teams“ in spirit rather than precise organizational detail.

The Bottom Line: Get Lean or Get Out

We've now had enough experience in one large industry to know that Western firms must master the four critical functions I have described and tie them together into a total lean enterprise – or face the prospect of extinction. The best Japanese firms have shown they can transplant their philosophy and organization to gain insider status in any major market, and – despite short-term political impediments – they will. Western firms, therefore, face the urgent need to get lean. For many, the next upturn in the economy may well be their last opportunity.

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