

# The Birth of Lean

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Conversations with **Taiichi Ohno**, **Eiji Toyoda**, and  
other figures who shaped Toyota management

Koichi Shimokawa *and* Takahiro Fujimoto, *Editors*

Translated by Brian Miller with John Shook

**The Lean Enterprise Institute**

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# Foreword

*From the Chairman of the Lean Enterprise Institute*

**Jim Womack**

Since the beginning of the Lean Enterprise Institute, we have been interested in the origins of lean. Scholars have written widely on this topic, and we have identified a number of volumes, including Takahiro Fujimoto's *The Evolution of a Manufacturing System at Toyota*, to recommend to members of the lean community. But we had not heard from the actual creators—those present at the birth of lean in the 1940s, 1950s, and 1960s—in their own words about just what they did and why they did it.

Fortunately, in *The Birth of Lean*, Fujimoto and Koichi Shimokawa have rectified this shortcoming. They have presented the insights of these Toyota pioneers through extensive interviews and annotated talks. This kind of personal commentary has never been available outside Japan. It comes to us through the editorial and translation efforts of longtime Toyota observer Brian Miller and Toyota veteran John Shook.

Although I have read practically all of the literature available in English on Toyota, I found the interviews, talks, and commentary in this volume enormously helpful in clarifying what actually happened and invaluable for those planning the path to lean transformation in their organizations. At a time when all of us are struggling to implement lean production and lean management, often with complex programs on an organization-wide basis, it is helpful to learn that the creators of lean had no grand plan and no company-wide program to install it. Instead, they were an army of line-manager experimenters trying to solve pressing business problems, in particular a lack of financial resources, to grow rapidly without accumulating large inventories.

Taiichi Ohno, Eiji Toyoda, Kikuo Suzumura, Masao Nemoto, and others you hear from here in their own words knew they could not solve their problems by employing the standard practices of large mass production organizations, as typified by General Motors. So they tried experiment after experiment, keeping careful notes on the results and spreading methods that worked.

Remarkably, they only came up with a name for what they discovered—the fabled Toyota Production System—in 1970 after they had invented and deployed all of the elements. And they only created a program office—now the Operations Management Consulting Division—at about the same time, after the Toyota Production System had already taken hold throughout Toyota’s operations.

I found Toyota’s approach heartening for those of us who have discovered the hard way that big, top-down lean programs rarely achieve the desired results. And I was inspired to hear the stories of line-manager experimenters who pushed steadily ahead without a grand plan but in a consistent direction, often over intense opposition.

Surely we can all make progress using Toyota’s approach if we clearly define our business problems and go to the *gemba*—the workplace—to experiment. I hope that you, too, will be enlightened and inspired by this volume as we all continue on our hard but rewarding lean journeys.

Cambridge, Massachusetts

March 2009

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# Preface

*Adapted from the Preface to the Japanese Edition*

**Koichi Shimokawa** and **Takahiro Fujimoto**

Toyota established a globally influential corporate model in the latter half of the 20th century. The model is most familiar as the Toyota Production System, though Toyota-style manufacturing encompasses more than the elements narrowly associated with that system. Most notably, Toyota's prodigious success has benefited crucially from total quality control (TQC).

Companies worldwide have adopted the Toyota Production System under the name of lean manufacturing. And TQC, which Toyota and other Japanese manufacturers built from American concepts, has taken hold worldwide under the name total quality management.

Numerous commentators have described in detail the structure and functions of the Toyota Production System and of TQC. Likewise, descriptions of the development of both systems appear in official corporate histories and in works by industrial historians. Nearly all of those descriptions, however, are after-the-fact accounts that focus to a fault on the rationalization and the competitiveness that the systems engendered.

The standard histories have largely overlooked the serendipitous process of creation, the trial and error, and the multiplicity of inputs that shaped both the Toyota Production System and TQC. That has encouraged mistaken notions that the development of the systems proceeded in line with some sort of master plan. We should bear in mind, incidentally, that the management, manufacturing, and marketing methodologies based on the "scientific management" of Frederick Taylor and on the conveyor line production of Henry Ford also evolved in a less-systematic manner than historical oversimplification frequently suggests.

Toyota has unquestionably displayed a tenacious consistency over 70 years in building competitiveness and in honing the fundamental capabilities that underlie that competitiveness. That consistency, however, has masked a stunning array of happenstance, confrontation, confusion, wrong turns, and occasional crisis. The ability to nurture a capacity for perseverant organizational learning amid that chaos is arguably Toyota's most essential core competence. On the following pages, individuals who were "present at the creation" offer a wealth of insight into that competence.

Individuals who shaped Toyota manufacturing definitively from the 1940s to the 1970s appear here through talks and interviews. The remembrances presented touch on dead ends, disputes, and differing interpretations that do not appear in the official histories. Sometimes highly subjective, they furnish an invaluable contribution to the historical record. Additional commentary by the editors rounds out the first-person accounts.

Maximizing the value of these recollections is the combination of voices. Here are first-person accounts from complementary perspectives: Taiichi Ohno, the Toyota executive who was the theorist behind the Toyota Production System; Michikazu Tanaka, a manufacturing executive at the Toyota affiliate (now subsidiary) Daihatsu Motor who was close to Ohno; Kikuo Suzumura, the Toyota manager who was most influential in implementing Ohno's ideas in the workplace; Kaneyoshi Kusunoki, a Toyota executive who collaborated and occasionally sparred with Ohno from the standpoint of production engineering; Masao Nemoto, the Toyota executive who led the company's adoption of TQC; and Eiji Toyoda, the leader who oversaw the development of the Toyota Production System and the introduction of TQC while steering the company's impressive growth.

Something that emerges convincingly in these talks and interviews is the continuing relevance of the basic principles of the Toyota Production

System and TQC. That lasting pertinence is astounding in view of the forces that have reshaped manufacturing in the past half century: information technology, globalization, flexible manufacturing, and shareholder activism, just to name a few prominent examples. Those forces have spawned innumerable management fads, and the proponents of each new theory have proclaimed a de facto standard for generating corporate value. Amid the ephemera of management fashions, Toyota's system remains the singularly enduring gold standard for global manufacturing.

Tokyo

January 2001 (revised in March 2009)

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# Introduction

*Adapted from the Introduction to the Japanese Edition*

**Koichi Shimokawa**

Factories that use the Toyota Production System bear a deceptive resemblance to those that use Henry Ford's system of flow-based mass production. Both kinds of factories center on conveyor lines that operate in smooth synchrony. That apparent similarity, however, masks a profound difference born of an epochal paradigm shift.

The Toyota Production System defies easy characterization, but its most definitive element is unquestionably the principle of just-in-time manufacturing. That principle marked a historic departure from the Ford system's high-volume, high-speed, make-to-sell production. Just-in-time manufacturing was a rejection of the wide-ranging loss inherent in Ford's approach: vast accumulations of part and product inventories, unnecessarily long changeover times for tools and dies, inefficiencies in the deployment of human resources associated with narrow skill sets and a resultant inflexibility in accommodating changing ranges of work, and immense waste caused by product defects.

Just-in-time manufacturing reduced waste by replacing the "push" dynamic of make-to-sell production with the "pull" dynamic of make-to-order production. In traditional manufacturing, processes throughout the production sequence operated with little regard for the pace of production elsewhere in the sequence and foisted their output onto the following processes—a practice that culminated in foisting make-to-sell accumulations of products onto the marketplace. In just-in-time manufacturing, each process withdrew material from the previous process only to replace material it had actually used, and each process generated additional

output only to replace material that the following process had withdrawn. Thus did the system provide for making only what is needed, only when it is needed, and only in the amount needed.

Practitioners of traditional manufacturing had countenanced large inventories throughout the production sequence as a necessary evil—necessary to keep things moving smoothly. In just-in-time manufacturing, any inventory in excess of a minimal “standard in-process stock” became absolutely unacceptable. Production of a limited range of products in large volumes gave way, meanwhile, to producing a large range of products in generally small volumes. That meant a shift in emphasis from maximizing equipment capacity and utilization rates to maximizing flexibility in responding nimbly to trends in demand. Factories shifted to processing in increasingly smaller lots. People found ways to shorten changeover times and streamline layouts to minimize the adverse effect of frequent changeovers on capacity utilization rates.

The paradigm shift embodied in the Toyota Production System established a framework for ensuring high productivity and—by building quality assurance into each process—consistently high quality. The flexibility of the Toyota Production System proved responsive to ever-changing markets and supportive of advances in product technology and of evolving approaches to product development and design. Equally important, the system proved applicable beyond Toyota’s factories. It took hold at suppliers’ factories, in purchasing organizations, and in logistics networks, and the synergies among the growing range of participants in the system maximized the benefits for all.

Revolution, an overused term, is a perfectly apt description for the change wrought by the Toyota Production System. The system was largely responsible for the surging international competitiveness of Japan’s automobile industry in the 1980s, as documented by the Massachusetts

Institute of Technology-based International Motor Vehicle Program. Japanese manufacturers of electronic equipment and of other assembly manufacturing products also employed elements of Toyota's system in asserting international competitiveness.

Japanese automakers and parts makers transplanted the Toyota Production System abroad when they began building large numbers of factories overseas in the late 1980s. Elements of the system soon started appearing in the factories of U.S. and European automakers: slimmed-down inventories, smaller processing lots and shortened changeover times, bar-coded kanban cards, "idiot-proof" features on equipment, lighted *andon* display panels above factory workplaces to indicate where problems were occurring, and sequenced withdrawal of parts and materials in accordance with the "pull" precepts of just-in-time manufacturing.

People at the overseas companies that emulated the Toyota Production System generally had an incomplete understanding of the philosophy behind the system. Worker participation, meanwhile, tended to be less thorough than in Japan, partly because of union rules and different labor practices. On the other hand, the growing application of information technology in factory operations, especially in the United States, favored the Toyota Production System. Database management furnished a new basis for evaluating manufacturing methods objectively and for retaining know-how of demonstrated value. It verified the effectiveness of elements of the Toyota Production System, and managements moved to adopt those elements in their operations.

Employee participation in the Toyota Production System in Japan has unfolded primarily in the context of tacit knowledge. Promoting similar participation in other nations has required companies to translate that tacit knowledge into explicit knowledge. Several business models have emerged for that purpose, and some of them cover far more than individual production processes. Companies have borrowed concepts and

methods from the Toyota Production System to foster just-in-time linkage all the way from product development through purchasing, manufacturing, and logistics to sales and service. They have used that linkage to focus activity throughout the value chain on earning and retaining customer satisfaction.

Manufacturers today face challenges of unprecedented severity. Automakers, especially, are struggling to survive. Toyota, too, was struggling to survive when Taiichi Ohno began experimenting with the methods that became the Toyota Production System. This is therefore an opportune time to examine carefully the convergence of factors that engendered the success of Ohno's experiments. Foremost among those factors was an unwavering focus on the *gemba*: the workplace.

The managers who worked under Ohno strove untiringly to explain his ideas to the workplace supervisors and to secure *gemba* participation in implementing those ideas. Toyota's continuing vitality is testimony to the vibrant workplace that the company has carefully fostered. It is also testimony to the company's continuing readiness to encourage the interplay of frequently conflicting ideas. Here, in the words of Taiichi Ohno, Eiji Toyoda, and four other remarkable individuals, is the story of how that interplay perpetrated a revolution in global manufacturing.