

The Birth of Lean

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

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What I Learned from Taiichi Ohno

A talk by **Michikazu Tanaka**

As recorded and edited by **Koichi Shimokawa** *and*
Takahiro Fujimoto *with* **Kenichi Kuwashima** *and*
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The Talk: Under the Guidance of Taiichi Ohno

Professor [Koichi] Shimokawa has asked me to describe for you my memories of Taiichi Ohno, the father of the kanban. I, like numerous others, owe a huge debt to Ohno-san. And since he has passed on, we who learned from him have a responsibility to convey his teachings to the next

About the Text

The accompanying text is an adaptation of a talk delivered in January 1998 by Michikazu Tanaka, a former executive of Daihatsu Motor. Tanaka gave the talk to a study group convened under the auspices of the Japan Technology Transfer Association and chaired and cochaired by the compilers of this volume, Koichi Shimokawa and Takahiro Fujimoto. The study group comprises automotive production engineers and university researchers and has met regularly since 1991 to develop a vision for production systems in the automobile and automotive parts industries. The adaptation presented here reflects subsequent editing by Tanaka.

generation. I don't know how well I can fulfill that responsibility in the limited time available here today. But I will try at least to describe Ohno-san's basic approach to kaizen, and I will offer some concrete examples.

My first encounter with Ohno-san was in 1967. Daihatsu had entered a strategic alliance with Toyota that year, and Ohno-san visited our headquarters plant, in Ikeda. I was a production manager there, and the first thing he said to me was, "You've got too many parts along the assembly line and too much work-in-process between the processes. You can't get any kaizen done in that mess."

I would hear that repeatedly during Ohno-san's plant tour. But I was a stubborn sort, and I was thinking all along that people have different ways of doing kaizen, that Ohno-san's way was not the only way. I couldn't see



Daihatsu's headquarters and plant in Ikeda, Osaka, in the 1970s

About the Speaker



Michikazu Tanaka (*center*) describing the principles of the Toyota Production System at the automotive tooling company Hashida Giken, whose president, Hiroshi Hashida, is seated at the right

Michikazu Tanaka spearheaded the transplanting of the Toyota Production System to Daihatsu, a manufacturer of mini-vehicles. He began receiving guidance from Taiichi Ohno in 1967, the year that Daihatsu entered into a strategic alliance with Toyota. And he demonstrated uncommon creativity and passion in adapting the Toyota Production System to needs and circumstances at his company.

Born in Osaka in 1926, Tanaka worked in manufacturing at Daihatsu for more than

how reducing the amounts of parts alongside the assembly line or reducing the amounts of work-in-process between the processes would promote kaizen. So I had viewed the parts and the work-in-process as something of a disinterested observer.

Ohno-san began appearing frequently at our Kyoto Plant in the early 1970s. Daihatsu was preparing to handle some of the production of the Toyota Publica there, and he was overseeing the introduction of the kanban system. I had no interest in kanban and had not paid any attention to what Ohno-san was doing at the Kyoto Plant.

Shortly after the production of the Publica got under way in Kyoto, a fatal accident occurred at the plant. That threw the plant into chaos. People were upset and didn't know what to do. My boss at the Ikeda Plant called me over to his desk and told me that he wanted me to move to the Kyoto Plant and get things back on an even keel.

I arrived in Kyoto a couple days after receiving the assignment. What I found there was appalling. All along the assembly line were mountains

four decades. He joined the company in 1949 and worked initially in equipment planning for plants and in plant management and production control. Tanaka rose to the rank of production manager at Daihatsu's Ikeda (headquarters) Plant, in the Osaka Prefecture city of Ikeda, and in 1973 moved to the Kyoto Plant, which then specialized in producing passenger cars. He served as deputy plant manager and then plant manager in Kyoto before returning to headquarters in 1983 as a managing director responsible for production. Named a senior managing director in June 1992, he retired from full-time work later that year.

Tanaka thus occupied center stage in the development of production technology at Daihatsu throughout his career. And he has remained active in retirement as an adviser to Daihatsu and as the chairman of a study group that promotes advances in surface processing at plants in Osaka Prefecture.

of parts. “Do you people think you’re working in a warehouse?!” was my initial greeting to my new colleagues.

We were working hard on quality control activities at Daihatsu at that time, and I had thrown myself into those activities head over heels. But what I found at the Kyoto Plant gave me pause for thought. Posted all over the workplace were materials for administering the quality control effort. Producing and displaying the materials had become an end in itself. We needed to get to work on more-substantive kaizen based on the actual circumstances in the workplace. So I told everyone to get rid of any and all materials that didn’t provide concrete guidelines for how to go about our work. We would retain only the materials that were obviously useful.

Thanks but no thanks

The production managers and group leaders at the Kyoto Plant were working feverishly on installing the kanban system when I arrived. But I

Daihatsu was and is the only automaker based in the Kansai region, centered on Osaka, Kyoto, and Kobe, and it boasts a history older than Toyota’s. But in the late 1960s, it was distinctly inferior to Toyota in product quality and in cost competitiveness. Joining the Toyota Group in 1967 presented Daihatsu with the pressing challenge of swiftly attaining Toyota-like standards in its diesel technology, in its vehicle technology, and in its production technology. That challenge became especially pressing in 1973, the year that Tanaka moved to the Kyoto Plant.

Toyota was growing rapidly in the early 1970s, and its plants were unable to keep up with the surging demand in Japan, North America, and elsewhere for the company’s small, dependable models. In 1973, the automaker entrusted some of the production of its smallest model, the Publica, to Daihatsu’s Kyoto Plant. That was the fateful year of the first oil crisis, and demand for Toyota’s

had yet to develop any interest in kanban. I simply observed their efforts from a distance and took part as little as possible in the endeavor.

Toyota had developed a somewhat upscale version of the Publica, the Publica Starlet, also to be produced at our Kyoto

Plant. The Starlet remained an ultracompact mass-market model. It carried an extremely low sticker price and would therefore be a low-margin undertaking, at best. Earning any kind of profit on the Starlet would demand drastic cost cutting.

We were producing a Daihatsu model closely related to the Publica, the Consorte, and we produced both models on the same line, using bodies supplied by Toyota. Our Consorte would remain in production, but the



The Daihatsu Consorte of around 1970, a sister model to the Toyota Publica

fuel-efficient cars was soon to burgeon more dramatically than anyone could have guessed.

Despite Daihatsu's shortcomings, the company was posting annual growth in sales and earnings amid the booming growth in Japanese vehicle ownership. Toyota had therefore turned a blind eye to issues at its new affiliate. But the production team at Toyota took a closer look when it entrusted a Toyota-badged vehicle to Daihatsu. No less than Taiichi Ohno, then the executive vice president for production at Toyota, took a personal interest in the project.

Toyota had largely completed the task of adopting Ohno's principles in all its plants and processes, and it had accompanied those principles with the regimen of total quality control (TQC). In 1973, Toyota was in the midst of propagating the Toyota Production System and TQC at its principal suppliers. Toyota suppliers in the Nagoya vicinity worked directly with Toyota plants and



Toyota's Publica Starlet of 1973

Starlet would entail a lot more parts than its predecessor. That would mean producing two very different models.

These days, automakers commonly produce two, three, or even more models on the same assembly line. But in those days, each assembly line produced only a single model. Our production team reviewed the proposal and determined that we would need a 10,000-square-foot building to handle the new Toyota model.

Ohno-san rejected our proposal out of hand. The Starlet, he insisted, was an economy model. Building a new plant would raise the fixed costs and render the project untenable from the outset. So much for Toyota, scoffed our production engineering people. What's impossible is

had already begun to absorb the basic concepts. Daihatsu, however, had little daily interchange with Toyota, and introducing the Toyota Production System there would be a unilateral undertaking. Ohno required an on-site evangelist, and Tanaka was his man.

What emerges from Tanaka's talk is Ohno's rigorous emphasis on (1) the *gamba gembutsu* (also *genchi gembutsu*) principle of focusing management on the workplace and (2) eliciting wisdom and innovation from people in the workplace. Ohno, we learn anew, was more interested in getting people to think for themselves than in telling them what to do.

People have understandably tended to focus on the technical aspects of the Toyota Production System. Tanaka reminds us of the crucial importance of the human aspect of motivating people in the workplace through inspirational leadership. As famous as the Toyota Production System has become,

impossible, they contended, and we could not possibly assemble the Starlet without a new plant building. Sentiment mounted in the company that we should refuse to accept the Toyota model.

Junichi Ono, Daihatsu's executive vice president for technology, came by my desk one day around that time and asked me for an opinion. "Ohno-san says that we should make the new car without putting up a new building. Our production engineering people say that's out of the question. What do you think?"

I replied in my typically irresponsible manner: "We might as well have a go at it. We don't know what's possible until we try. And if things don't work out, we can always take it from there." That was not to suggest that I was especially confident that we could produce the new model without a new plant. And my boss was no more confident than I was. But we decided to tell Ohno-san that we would have a go. My boss and I went to Toyota to deliver our response, but Ohno-san was out, so we simply left a message: "We'll do it without building a new plant."

questions remain about the applicability of the system in divergent corporate cultures and cultural milieu. Toyota's experience in transferring the system to Daihatsu is thus a hugely instructive episode. That episode is, indeed, the original blueprint for transplanting the system to new and unfamiliar environments.

When I got back to the Kyoto Plant, the plant manager was away. I took the liberty of assembling the production managers and told them that we had decided to produce the Starlet. They exploded and pummeled me for about two hours with reasons that it was impossible. After listening to the litany of impossibilities, I explained that I understood perfectly well why it was impossible but that we had decided to produce the Starlet nonetheless. I told the managers that, henceforth, I was interested in hearing about ways to produce the new model and that I had no more patience for listening to why it was impossible. I called on them to join me in figuring out how to make the new project work.

The years have mellowed me, but back then I was as pigheaded as they come. People knew that once I had made my mind up they would never persuade me otherwise. The production managers were soon coming forth with ideas for achieving the necessary cost reductions. In one example, we were producing batches with a stamping machine that extended over 12 shifts, and we reduced the batch sizes to 6-shift lots. That halved the space required to store in-process stampings, and we would be able to use the freed-up space to store parts for the second model. Everyone got into the act.

People in every process found ways to save space over the next six months. We carefully maintained the newly available space to have it available when the time came to add a second production model. While



Daihatsu's Kyoto Plant around 1970

we were working successfully to free up space, I heard through the grapevine that Ohno-san had softened his stance. He had apparently told a subordinate to go have a look at our Kyoto Plant and to let us know that, if absolutely necessary, Toyota might

acquiesce to a second plant building. I dispatched a defiant message to Toyota: “Thanks but no thanks. We’ll get the job done with the facilities we have.”

Ready, set, go!

Ohno-san came around about once a month during the preparations for mass production. He always brought along a Toyota general manager from production engineering by the name of Takemoto. I overheard him telling Takemoto, “If this project doesn’t go right, you’re out of a job. And so am I.” Although Ohno-san was an executive vice president, I could tell from the tone of his voice that he meant what he said. That inspired me to work even harder to succeed.

At a meeting one day, Ohno-san asked our president, Sakae Ohara, who his contact person should be for the Starlet project, and Ohara-san named me. I was sitting about three rows back, but they called me up to the front of the room. That was exactly the fate that we all tried to avoid in dealing with Ohno-san. Everyone was interested in hearing what he had to say, but no one wanted to face questions directly from the man while standing at the front of a crowded room. That was because of Ohno-san’s method. If he had 10 things that he wanted to tell you, he’d tell you 2 and expect you to think for yourself until you came up with the other 8.

You can imagine anyone’s terror at having Ohno-san look them in the eye and ask, “What do you think?” I had yet to develop any interest in the kanban system, and I couldn’t help thinking that Ohara-san had deliberately named the manager least passionate about Ohno-san’s signature tool.

The day of the start of mass production finally arrived. I summoned all the production managers for a meeting a little before 8 a.m. “Ohno-san is bound to show up before the week is out,” I cautioned them, “so

let's make sure that we get things shipshape over the next few days." No sooner had I spoken than a woman entered the room to report that she'd just received a call from the guardhouse at the plant gate. Ohno-san had just entered the plant. I rushed to meet him, and we talked for about 30 minutes. Predictably, he grew impatient and insisted that we go have a look at the workplace.

We started at the body line. After Ohno-san had observed things for a while, he pointed at a man in a main process on the line and asked me, "Is he behind or ahead in his work?" I had no idea and could only answer honestly, "I don't know." Ohno-san, visibly unhappy, turned to the foreman responsible for the shop and asked him the same question. I don't remember how the foreman answered, but he gave a clear answer, either that the work was running ahead or behind. That exasperated Ohno-san all the more, and he barked at me angrily, "Your foreman is lying. I'm standing here watching, and I can't see if the work is running ahead or behind. There's no way that he could know any better."

Ohno-san then demanded a blackboard, and I escorted him into a meeting room. He headed straight for the blackboard and, chalk in hand, drew a line. "When you ran races in school, you had a starting line, right? Everyone started at the same line, and ready, set, go! they all started running. You could see who was the fastest, who was the second fastest, who was the slowest. But if everyone starts at a different place, you can't tell who's fastest. That's what's happening in the work that we just saw. You can't tell who's running ahead and who's running behind. You can't see where problems lie, and you've got no basis for doing kaizen. You've got to work as if you were putting things on a conveyor, even where you're not actually using a conveyor. And to do that, you need a pacemaker."

Getting into the spirit

Our task, therefore, was to come up with an effective pacemaker. Toyota's Takemoto and I considered different possibilities and finally settled on a buzzer as the easiest for everyone to understand. We installed the buzzer at the middle of the main line so that it would be audible to everyone, even at the front end and back end of the line.

Ohno-san came around again about a week later and promptly denounced our pacemaker. "That's no good at all. Your workers will feel like they're under pressure all the time." This is a side of Ohno-san that you don't hear much about, and I want you to listen carefully. Contrary to the image that most people have, Ohno-san cared a great deal about employees in the workplace. You read that he was some kind of ogre who was always trying to squeeze one more drop out of a dry towel. But the real man was not like that at all.

"The last thing you want to do," he explained, "is make your people feel like they're always under the gun. If you want to use sound for your pacemaker, use a pleasant melody, not a shrill buzzer. And let the employees choose the melody. Also, you need to install the speakers at three places, not just one."

Ohno-san and I discussed several things for a couple of hours. Then he suddenly asked, "Have you worked out the new positioning for your pacemaker speakers? Are they already in place? When will they be ready?" I found a plant administration manager and asked him when we would have the speakers installed in three places. "We'll do it this Saturday," was the prompt reply. I conveyed that answer to Ohno-san without any sense of contradiction, whereupon he told me the following story.

"I was at the Takaoka Plant the other day. They had a lot of body shells hanging from the overhead conveyor in the paint shop. I told the general manager that he had too much work-in-process and instructed him to

reduce the volume. He replied, 'We'll get right on it. Give us a little time.' I assumed that he meant an hour or two, and I went back after a couple of hours and asked, 'Have you taken care of the excess work-in-process?' His answer was, 'We'll get it done this Saturday.' 'Fine,' I said, 'and in the meantime, I'm going to trash all these body shells hanging here. Get me a ladder and a hammer. Now!' The general manager gained a new sense of urgency, and he got the job done right away."

On hearing that story, I began to feel extremely uncomfortable seated in the office. I excused myself and went out into the workplace to get the speakers installed.

Ohno-san needed to attend a meeting that evening in Nagoya and therefore needed to leave our Kyoto Plant by 4 p.m., at the latest. A little before three o'clock, I went to check on the speaker-installation work. When I told the people to hurry up, they protested that they were working as fast as possible but that they could not get the job done by four o'clock. I told them they could use temporary wiring or anything necessary to speed things up.

When we finally got the speakers installed, it was nearly five o'clock. Ohno-san was still in the meeting room when I went to report that the job was done. He hadn't spoken a word since one o'clock, and the atmosphere in the room was sort of eerie.

On receiving my report, Ohno-san simply got up and said, "I'm leaving now."

"Please come and have a look at the speakers," I begged.

"No, I'm leaving."

"Everyone worked really hard to get the speakers installed. The least you could do is stop by and have a look."

"You've finally got in the spirit of things, haven't you? As long as you've got in the mood to get things done, then I'm satisfied."

A friend of labor

Ohno-san came by the Kyoto Plant about once a week for the next six months. He reminded us frequently and severely what we needed to do:

“Make do with the equipment you’ve got.”

“Don’t automate anything.”

“Don’t spend any money.”

“Limit your production output to the numbers in the sales plan.”

“Your costs will eat up all your profit if you don’t watch out, so don’t hire more people.”

As soon as we had complied with Ohno-san’s insistence on monitoring the pace of work cycles, he raised the stakes. “Simply determining whether a cycle is too fast or too slow isn’t good enough. You need to monitor the pace of work inside each cycle.” So we divided the cycles into five parts and set up a sound system to play music at the completion of each part, including music to indicate the completion of the whole cycle. Everyone working on different processes in the same cycle knew when they should be one-fifth done, when they should be two-fifths done, and so on.

We rigged the processes so that a yellow *andon* lamp shined when the work was four-fifths done and a blue *andon* shined when the work for the cycle was completely done. A red *andon* light would shine at a process that was running behind. When the lamps at all the processes were shining blue, the music would stop and the next cycle would begin.

Our system prevented any process from moving on to the next work cycle before all the processes had completed the work in a cycle. That linked the pace of work to the pace in the slowest process, and it was difficult to get used to. People found themselves waiting all the time for someone in some process to catch up. Capacity utilization stagnated. We could only produce four or five vehicles per hour at first.

Ohno-san, however, was patient. “Improve things little by little. Make sure that the process that caused problems this morning doesn’t cause problems this afternoon. The way to increase your hourly production volume is to recognize problems when they occur and to make the necessary improvements to prevent them from recurring.”

We had formerly regarded our workflow as a conveyor that we started and stopped. Ohno-san’s “ready, set, go!” concept changed our basic perspective. In our new approach, everything came to a stop if a process fell behind, and everything started up anew when all the work in a cycle was done. It was still a conveyor concept, but the conveyor started and stopped on its own. People in our plant formerly had pressed a button to indicate the end of a cycle. Pushing buttons is not the object of our work, however, and the act of pushing wasted a second or more of time. So we devised sensors that detected when operators had placed tools in positions that indicated the end of a cycle. The sensors triggered the *andon* lamps and the music.

One day, Ohno-san demanded—without offering any reason—that we get rid of the automated equipment for conveying side panels between processes. Side panels are big and heavy, and they are difficult for even two men to carry. Conveying them manually would mean considerably more work. Why Ohno-san wanted us to remove the automated conveyance was a mystery, even to Toyota’s Takemoto.

The people in the workplace appealed to me to ask Ohno-san to reconsider his order. I was just a deputy plant manager at a Daihatsu plant. Ohno-san was an executive vice president at Toyota. I was in no position to challenge his judgment. So I reminded our people that Ohno-san was a production genius and that he surely had a good reason for wanting us to get rid of the automated conveyance. I understood perfectly well, however, that conveying the side panels manually would impose a huge burden on our employees, and I set about thinking of new ways to handle

the task. One way would be to assign more people to the work, but that, of course, was not an option. Instead, we devised some jigs for hanging the panels from a rail and pulling them from one process to the next.

Our automated equipment had raised the side panels straight up and then moved them horizontally to the next process. But our manual pulley system pulled the side panels directly toward the next process along a diagonal path. So the manual system conveyed the side panels faster than the automatic system had. Sure enough, Ohno-san had noted the time loss that our automated system entailed. Only when we actually tried an alternative method in the workplace did we see how much time we were wasting.

Ohno-san cut right to the chase on his next visit: “Has the removal of the automatic equipment been causing headaches for people in the workplace?”

“It was a problem at first,” I acknowledged. “And we experimented with a number of possible solutions. We finally settled on a pulley system, which has actually reduced the conveyance time some.”

“That’s good to hear. I wasn’t entirely confident about how things would work out. And I was thinking in the car about the trouble that I might have caused for your people. But I know that the workplace can be a source of incredible wisdom when the need arises. That really is good to hear.”

Ohno-san repeated two or three times during our conversation that he had been worried about causing trouble for people in the workplace. He was the first senior executive who I ever heard express that kind of concern. I knew then that he really approached kaizen from the standpoint of the workers. I knew how wrong people had been to suggest that he was an enemy of labor.

Gemba gembutsu

Kaizen raised our productivity from four or five vehicles per hour to six and then to eight. Ohno-san turned his attention to time loss that he perceived in the conveyance equipment on our main assembly line. We were using a shuttle system, which he denounced as wasteful. Ohno-san noted the time that work-in-process sat waiting for the shuttle, and he instructed us to devise a way to send bodies on to the next process as soon as they were ready and needed.

Our shuttle system launched a body toward the next process as soon as the previous body was safely out of the way. But that could impose delays. I was beginning to get a feel for Ohno-san's way of thinking, or at least I thought I was. And what I thought was that he was interested in pushing things to the limit. I issued instructions to our people based on that understanding: come up with a system that will put the next body in motion as soon as the previous body starts moving.

Soon after we modified the system in accordance with my instructions, an accident occurred. An employee who had gone behind a body to work on the back panel got sandwiched between that body and the next body. Fortunately, he didn't get hurt. But I got a scolding from Ohno-san on his next visit. He asked what we had done about the time loss that he had noted on his previous visit. And I explained that we had squeezed things to the limit but that an employee had got pinned between two bodies.

"You're going about things completely wrong," he declared. "You're moving things in anticipation of needs in the next process. If you're going to do that, you need to make sure the coast is clear before you put things in motion."

I never heard anything again from Ohno-san about time loss in conveyance on our main assembly line. He was more interested, I had discovered, in our basic stance than in what we actually did.

Under Ohno-san, our basic stance came to include synchronizing activity in the production sequence with kanban, and what we did included using kanban as instructions to start work in each process. We didn't have any welding robots back then, so all sorts of cables for the hand welding tools were hanging down around the line. Those cables obstructed the operators' view of the work instructions, and we received a request from the workplace to install a television monitor to display the instructions.

I approved the installation of the monitors, and the operators reported happily that the displays made their work a lot easier. Our plant manager told me to get rid of them, however, on the grounds that Ohno-san hated television monitors. I argued that Ohno-san might hate monitors in principle but that he was a man who welcomed anything that made work easier for employees. I assured the plant manager that Ohno-san would acknowledge the value of the monitors, and I left them in place. We raised the subject with Ohno-san on his next visit. Declining to render judgment sight unseen, he said, "Let's go have a look." Ohno-san stood in the position of the welding operators and acknowledged forthrightly that the work instructions were difficult to see and that the television monitors were a good idea.

Gemba gembutsu [also *genchi gembutsu*: a commitment to seeing things (*gembutsu*) firsthand as they really are in the workplace (*gemba* or *genchi*)] was absolutely fundamental to Ohno-san's approach. He never rendered judgment simply on the basis of hearing about something. He always insisted on going to the place in question and having a look. On occasions when we might press him for an opinion, he'd say, "You're the one who has seen the thing. You know better than I do. How could I talk about something that I haven't seen?"

A key to kaizen

Ohno-san was extremely demanding in regard to kaizen results, but he had an uncanny sense for what was possible in the circumstances. Asked about our progress in raising productivity, I reported proudly that we were up to 8 vehicles per hour, and he said, "I see. So next week, let's get it up to 10." When I reported that we had reached that target, he said, "So now get it up to 12." That continued week after week. Takemoto reflected on the effort that everyone was putting into achieving the targets and wondered aloud if Ohno-san would ever be satisfied.

Something interesting happened when our output reached 16 vehicles per hour. Ordinarily, I had reported our latest rise in productivity with words like, "Ohno-san, we did it!" But when I announced our attainment of 16 vehicles per hour, I said something like, "We finally got it up to 16." I don't know if my words betrayed fatigue or not, but for whatever reason, Ohno-san never again voiced the subject of hourly output. He still had a higher target in mind, however, and he steered us next to some modest automation. Sixteen vehicles per hour took us above the break-even point in our initial production planning. But Ohno-san was now aiming for 20 per hour.

To oversee the automation kaizen, Ohno-san brought along a man from Toyota by the name of Imai. "We've got a lot of people at Toyota," grumbled Ohno-san, "but hardly any of them have any real wisdom. Imai is an exception." I wondered what Imai would do for us in the way of kaizen, and for a week he did nothing at all. He simply watched what was happening in the workplace. On the Monday of his second week at our plant, he came by my desk and described his impressions and his plans as follows.

"I watched the activity in your workplace carefully for a week, and I saw that people are working extremely well. I struggled to think of some-

thing that I could do for you, and my conclusion was that I have no role to play here.

“I stopped by Ohno-san’s house on the way home Friday evening and told him what I have just told you. He said, ‘Your problem is that you’re trying to think of something to teach the people at Daihatsu. You don’t need to teach them anything. What you need to do there is help make the work easier for the operators. That’s your job. Do some simple kaizen. Do some small-scale automation.’

“I finally know what I’m supposed to do here. And that’s what I’m going to do.”

My habit was to take a walk through the plant on my way home each evening. One evening, I noticed a light on in the body shop around eight o’clock. We didn’t have much overtime at that time, so I was curious and went to have a look. A few men were holding a discussion. One was Imai. Another was a team leader. He explained that they were testing the ejection mechanism on a benchtop spot welder and that it wasn’t working very well.

I suggested that they go ahead and try using the mechanism, as long as they had gone to the trouble of making it. At that point, Imai asked someone to bring him an acetylene torch, and he proceeded to cut off the ejection mechanism. I asked what in the world he was doing, and he replied that they would keep modifying the welder until the operators were completely satisfied.

“Good kaizen,” said Imai, “depends on the active cooperation of your employees. You might think you’re on the right track. But unless your employees are taking part actively, you’ll never get the full potential of the improvements. That’s why we’re going to keep working on this until the people in the workplace think we’ve got it right.”

About a week later, I again saw a light on late one night. This time, two operators were working on a new version of the ejection mechanism.

“We’ve just about got it right,” said one of the operators. “But we want to make sure that we don’t cause problems for people, so we’re making some extra parts tonight.”

The two operators working late had the same spirit as Ohno-san. And they had gotten that spirit by seeing his example. The people on the plant floor never talked directly with Ohno-san during his visits. They received his instructions through me. But they saw him there. They saw how he took an interest in their work. And they saw the results of his guidance. Plant managers always made a special effort to prepare for a visit by a VIP. But people in the workplace rarely paid any heed. Visits by Ohno-san, however, were different.

“When’s Ohno-san coming next?” someone would call out and ask me when I was walking through the plant. “He’ll be here again next week.” “We’d better get things right by then,” the operator would shout back.

The company union’s officials called me in one day and complained that what we were doing at the Kyoto Plant was labor abuse. They had the same misconception about Ohno-san that I had before I met and worked with him: that he was an enemy of labor. I described how my own impressions had changed as I saw Ohno-san in action—as I saw how he genuinely cared about people in the workplace and how he went out of his way to make work easier and more fulfilling for the employees. And I added in the spirit of *gemba gembutsu*, “But don’t take my word for it. Go have a look. Ask the people in the workplace what they think.” I heard later that someone from the union office had gone to the Kyoto Plant and that none of the employees expressed any dissatisfaction.

The real purpose of kanban

What became clear during my work with Ohno-san is that his chief interest was something other than reducing work-in-process, raising productivity, or lowering costs. His ultimate aim, I gradually learned, was to help employees assert their full potential. And when that happens, all those other things will occur naturally. I put the question directly to Ohno-san at the end of our six months of intensive work under his guidance.

“Ohno-san, I’m grateful for everything you’ve done for us over the past half year. And I want you to know that I was completely wrong about the kanban. I thought of it entirely in terms of reducing work-in-process, raising productivity, and illuminating problems. Of course, it is good for all those things. But your basic aim is something else, isn’t it? You use the kanban to create a positive tension in the workplace by reducing work-in-process, and that motivates people to do better than they ever thought they could do. Isn’t that what you’re really aiming for?”

Whenever someone said something wrong, Ohno-san was unhesitating with an unambiguous “No.” But he never said “Yes.” The way you knew he agreed with something was that he said nothing. And my question elicited an affirmative silence.

A professor from a German university came to our plant one time to learn about the kanban system. He started off by asking me about the purpose of kanban. I replied that the kanban was a tool for tapping people’s potential by fostering a creative tension in the workplace. “I had always heard that kanban were for reducing inventories,” he replied, “but your answer makes more sense.”

In my talk, I have covered only some of the most trying incidents and most gratifying incidents in our work with Ohno-san. I hope that my remarks have conveyed the most important message: that motivation is everything. Tools and methods are secondary. Any tool or method will

work if people are motivated. And no tool or method will work if people are not motivated. That's what I learned from Ohno-san.

To us, Ohno-san was like a god. But he was ever aware of his fallibility, and he was determined not to let his mistakes become a burden on people in the workplace. That's why he was always impatient to try out new ideas immediately. "I don't always get things right," he'd say. "And if I've got something wrong, I want to fix it right away." And that's why we scheduled our kaizen in minutes and hours, not in days and weeks.

Ohno Anecdotes and Aphorisms

1. Kaizen

Ohno-san would scold us, saying, "Simply staring at things is no way to find out how to make them better. Your eyes are wide open, but you're blind as bats!" "But Ohno-san," someone would protest, "blind is a derogatory term." "Is that right? Well then, you've got tinfoil over your eyes [to make them shine as if they were open]."

"If you're going to do kaizen continuously," he'd go on, "you've got to assume that things are a mess. Too many people just assume that things are all right the way they are. Aren't you guys convinced that the way you're doing things is the right way? That's no way to get anything done. Kaizen is about changing the way things are. If you assume that things are all right the way they are, you can't do kaizen. So change something!"

"When you go out into the workplace, you should be looking for things that you can do for your people there. You've got no business in the workplace if you're just there to be there. You've got to be looking for changes you can make for the benefit of the people who are working there."

Here's an example of Ohno-san's approach. He was observing the work on an engine assembly line one time when he was a plant manager, and

he noticed that one of the workers needed to lift a heavy engine block once during each work cycle. Ohno-san wondered why that was necessary. He called the production chief over and ordered him to go find out what was going on. The production chief came back and reported that the roller conveyor was broken.

“What in the world do you think you’re doing here?” shouted Ohno-san. “We don’t hire people to lift engine blocks. You go check and see right now if you’re not sitting on other problems just like this one.” The production chief soon reported three similar problems, and he received the predictable scolding from Ohno-san. “You’re out here on the floor every day, but you’re not really seeing anything: whether your people are having problems with something, whether waste is happening, whether you have overburden somewhere.”

Ohno-san insisted that only about half of the activity in a typical workplace was value-added work. The rest was just spinning wheels, not making any money for the company. He taught us to see. I took a fresh look at the workplace, and I could see that he was right, that waste was happening everywhere.

Another thing Ohno-san said about kaizen was that we should never listen to the shop veterans. “They just get in the way of kaizen,” he’d say. “As much as possible, get the opinions of the people who are actually doing the work. Wisdom is born from the ideas of novices. The veterans will spout off about what’s possible and what’s not possible on the basis of their experience and a tiny bit of knowledge. And when the veterans speak, everyone else keeps quiet. So kaizen can’t even get started.”

Here’s a funny story in that connection. My uncle is 93 years old, and he’s hard of hearing. The ear, nose, and throat specialist told him that he needed hearing aids, that it was only natural for someone in their 90s to wear them. So my uncle bought an expensive pair of hearing aids. One day soon after that, he happened to go to the barber.

“My hearing has failed recently, so I got these hearing aids.”

“Have you had your ears cleaned lately?”

“Can’t say that I have.”

“Let’s have a look,” said the barber. And he promptly dug out a couple of huge clumps of wax from my uncle’s ears. All of a sudden, my uncle could hear perfectly well—without the hearing aids.

I heard this story straight from my uncle. It’s a pretty good example of how specialists, like his doctor, get hung up with their experience and expertise. The barber is a pure amateur from a medical perspective, so he doesn’t get caught up with all the technical possibilities. Veterans [in the production workplace tend to] look at the world from the perspective of their experience and expertise, so you can’t rely on what they say. You’ve got to listen to the amateurs.

Conditions in the workplace are the basis for all kaizen. You can’t come up with useful kaizen sitting at your desk. You can think in terms of hours while you’re sitting at your desk, but you can’t think in terms of seconds. Ohno-san always reminded us that the processes move in seconds when we’re making things, so we need to monitor the movement of things and people in seconds to find opportunities for kaizen. And he kept telling us to focus on what’s actually happening in the workplace.

2. The Workplace as Fact

Ohno-san hated written materials. If you took him some papers to see, he might go through the motions of looking at them, but he wouldn’t really pay any attention at all. You’d be trying to explain something in the documents, and you could tell from his eye movements that he couldn’t care less. When you got done, he’d hand the papers right back to you. He’d give really detailed instructions in the workplace, but he almost never had anything to say in response to written reports.

I never saw any papers on Ohno-san's desk. That's no exaggeration. Literally, no papers at all. The only documents I ever saw him pay any attention to were the factual records of production and sales results: things like how many vehicles we sold yesterday, how many vehicles our plants produced yesterday, what the operating rates were, and so on. Those numbers were records of actual results, so they were indisputable facts. Ohno-san had no interest in any other written materials. He only trusted things that he could confirm with his own eyes.

I visited Ohno-san one time at Toyoda Boshoku (Toyoda Spinning and Weaving) when he was the chairman there. He was in a foul mood and promptly let me know why.

"Some guys in charge of kaizen at Toyota were just here. They said they were going to hold a jamboree to introduce case studies and that they wanted me to come. I got angry and told them that kaizen is about eliminating waste. I asked why they would hold a kaizen event that entailed the waste of preparing a lot of useless materials. People can see the kaizen in the workplace. I told them that they didn't have a clue. Their job is to eliminate waste, and they're the ones creating waste."

The group responsible for kaizen at our company came to me sometime after that encounter with Ohno-san and asked for some materials. I refused and told them how angry Ohno-san would be at such a request. They insisted that they needed to make a report about the kaizen activities. I asked why they needed to make a report when people could see the actual kaizen in the workplace. I told them to show people the kaizen in practice.

We have too many people these days who don't understand the workplace. They've got that tinfoil over their eyes. They think a lot, but they don't see. I urge you to make a special effort to see what's happening in the workplace. That's where the facts are. And the truth is hidden in the facts. Our job is to get a handle on the truth.

3. Problems

When Ohno-san sensed a problem, he'd spend an hour or even two hours at one spot. He'd peer at things while chain-smoking. Sometimes, he'd forget about his cigarette, and it would burn all the way to his lips.

One time, Ohno-san called me over as he was watching over a workplace while smoking. "Something's not right in the motion of that worker," he pointed out. I was one of those guys with tinfoil over their eyes, so I didn't see what he meant, and I said so. "Look at his hands and feet. He keeps changing the way they move. Either he's doing the work wrong or something is creating an overburden in the process. You need to find out what the problem is. If you stand here and watch for a day, you'll figure it out."

Ohno-san would keep looking at things for as long as it took to figure out what the problem was. He warned us that "waiting until you've seen the data is too late for kaizen. You can evaluate the day's data and figure out that 'hey, that machine stopped a lot' or 'that process was improving,' but the horse is already out of the barn. A whole day has passed while you were processing the data. You've got to act on the spot."

"Acting on the spot" is wonderful in principle, but you've got to know where to look. You need to look where the biggest problems are. That's where the *andon* lamps come in. The *andon* lamps [which light up when employees pull the line-stop cord to indicate trouble] tell you where the problems are happening. You need to go to those places and examine the processes carefully. If you watch carefully, you'll see what's causing the problems. Then, you can do your kaizen improvements. Doing that again and again is how you raise productivity. Of course, new issues keep arising, as when the *takt* time [*takt* being the German word for "meter," and *takt* time being the time increments at which the following process required parts] gets quicker or when you reduce your staffing on the line.

4. The Line-Stop System

Everything was moving smoothly on our assembly line one day when Ohno-san arrived and I showed him around. No red *andon* lamps went on to indicate problems, and the line didn't stop at all. That had me worried. And sure enough, Ohno-san was irritable by the time we'd walked through about half of the line.

"You've got," he finally blurted out, "too many people on the line. You need to staff your line at a level where the line stops about 10% of the time. That's the only way to make sure of getting problems out into the open. People think that everything's great if the line keeps moving. But that's wrong. Even if your operating rate is 98%, you've got too many people. You can't afford to take pride in a line that keeps moving. You've got to make sure that your people on the line can stop the line and that your supervisors can't.

"Most of all, you've got to avoid making your operators think that they shouldn't stop the line. You need to have your operators abide by the standardized work and to turn out high-quality products. You can't put pressure on them to do any more than what is naturally possible. If the line stops, it's your job to figure out the problem and to do kaizen improvements to solve the problem. If the line stops, that means you've got a problem that needs solving."

So a high operating rate might simply mean that you have too many people on the line. You need to work continuously to get problems out into the open. That's the way to raise productivity.

5. Work-in-Process

Maintaining a lot of work-in-process lets you keep the line moving, even if work runs behind somewhere. As a result, you don't notice the

problem [that caused the delay]. We might have three pieces of work-in-process between two processes on the assembly line. Ohno-san would come along and bark at us to get that down to just one piece. As soon as we did that, our operating rate would plunge. Our buffer of three pieces [of work-in-process] had been absorbing delays in work along the line. When we got rid of the buffer, the delays affected work everywhere on the line immediately.

Ohno-san would say, “If you’ve got three pieces of work-in-process, reduce that to two. If you’ve got two, reduce it to one. The ideal is to get it down to zero. But reducing work-in-process is not the object. The object is to expose problems. If problems stop showing up, reduce your work-in-process. None at all is best.”

The line stops as soon as you eliminate your work-in-process. You don’t know when or where the next delay will occur. That keeps your supervisors on their toes. It’s like being out on the street. If you’re walking along a broad street that has no traffic, you can waltz along without a care in the world. On the other hand, if you’re walking on a narrow lane—and if one side of the lane is a cliff—you need to watch your step. Getting rid of work-in-process enforces that kind of alertness. You reduce the work-in-process to get everyone to feel that tension.

That’s why Ohno-san said, “If your line never stops on account of some process keeping the next process waiting, you’ve got too much work-in-process. You want to have occasional stoppages caused by parts shortages. Of course, you don’t want your line to be stopping all the time. But the occasional delay caused by a process keeping the next process waiting for an item is good. If that stops happening, reduce your work-in-process until it starts happening. You’ve got to maintain that kind of intensity to make sure that problems become apparent. You shouldn’t think that no shortage of parts is a good thing.”

6. The Quality of Work

No one ever got a scolding from Ohno-san for getting something wrong as long as they were doing their best. But he'd turn red in the face and deliver a severe tongue-lashing to someone who was slacking and made excuses for messing something up. He was absolutely livid one time when he found us ordering parts with a fixed schedule. We were doing that because kanban were hard to use at first, and Ohno-san exploded.

“Are you trying to destroy your suppliers? Don't you understand the trouble that you cause the suppliers by issuing production instructions on the basis of a schedule? Can't you see that you'll stick them with unnecessary inventory if your production volume dips?”

Ohno-san was extremely attentive to the fundamentals of work and to the work process. He believed strongly that things would work out right in the end as long as everyone was doing their best and using their head. Anyone can work hard. But it was doubly important to work hard in a way that demonstrated some thinking. He was less interested in seeing people work up a sweat than in seeing them improve work in ways that let things get done smoothly.

7. Solid Work

Our assembly line stopped one time while Ohno-san was watching. A production manager ran to see what the problem was and came back with the following explanation: Someone had checked a part after attaching it and had discovered that the part was faulty. So the workers were removing the part and attaching another one.

On hearing the explanation, Ohno-san laughed angrily. “You guys are stupider than chickens. If you thought some food might be poisonous, would you gulp it down without checking it first?” Checking a part before

attaching it takes no more time than checking it afterwards, and it can save a lot of trouble.

I taught myself a valuable lesson once when I needed to pick up some important visitors at Kyoto Station. I had gotten a call from our headquarters' secretarial division. Some transport officials from the government were going to visit our Kyoto Plant in a couple of days, and the secretarial division wanted me to pick them up at 3 p.m. I wanted to make sure I didn't miss them, so I asked for the number of the train on which the visitors would be arriving.

On the day of the visit, I double-checked the train number, and I learned to my surprise that the scheduled arrival time was one o'clock, not three. Fortunately, I had just enough time to get to the station before the train arrived, and everything went smoothly in the end. I had just happened to think to ask for the train number, and that had enabled me to avert a humiliating misconnection. The experience reminded me of the importance of making sure that you have information to check things against and of making sure that you do the checking.

Contingency planning is also essential in ensuring that work gets done right. Simply assuming that things will go according to your original plan is irresponsible. You've got to prepare for unexpected events.

8. Mutual Assistance

"You can't gauge people's capabilities with perfect accuracy, so you inevitably end up with some imbalances in allocating work. To keep work moving smoothly, the people in each process need to be prepared to help out in other processes. You need to provide multiprocess training so your people can help out wherever help is needed.

"Japanese these days seem to have lost the spirit of mutual assistance. An inscription at the site of the historic Antaka no Seki checkpoint [in

Ishikawa Prefecture] cites wisdom, courage, and benevolence as the conditions for overcoming adversity. [That checkpoint was the scene of an oft-cited but apocryphal incident in Japanese lore of the 12th century. Minamoto no Yoshitsune had jointly led the overthrow of Japan's ruling clan, the Tairas, with his older brother, Minamoto no Yoritomo. But he had angered Yoritomo with his subsequent conduct and was fleeing for his life, a flight that was to prove unsuccessful. Yoshitsune, disguised as a monk, was traveling in the company of the wise monk Musashibo Benkei. They famously secured safe passage past the checkpoint, thanks to the benevolent assistance of its overseer, Togashi Yasuie.]

“The wisdom of Benkei and the courage of Yoshitsune would not have been enough in themselves to secure safe passage past the checkpoint. The benevolence displayed by Togashi was indispensable. Assistance from third parties can be essential in coping with challenges.”

9. Automation and Intelligent Automation

[The Japanese word for automation is *jidoka*. It comprises three kanji: 自 (ji), for self or auto; 動 (do), for motion; and 化 (ka), which corresponds to the “-ation” suffix. The *jidoka* familiar to students of the Toyota Production System shares the first and third kanji with its homonym, but the middle kanji is slightly different: 働. Toyota has replaced the kanji for mere motion with the kanji for work. The additional element on the left side of the kanji (亻) is, by itself (as 人), the kanji for person.]

“Toyota's *jidoka* means investing conventional automated equipment with capabilities ordinarily associated with human wisdom: the ability to check quality and the ability to stop when problems occur and to call attention to the problems. When we install automated equipment, we need to add the element of human wisdom and make it *jidoka* equipment [in the Toyota sense]. And we need to provide equally wise linkage between

the machines. That means devising [pull] linkage that synchronizes the operation of the preceding machine with the operation of the following machine rather than [push] linkage that arbitrarily feeds items from one machine to the next [regardless of the pace of work in the following process].

“*Jidoka* linkage prevents absolute timing loss. Push linkage with a conveyor causes problems. Volkswagen and other automakers would station a person at conveyor connections [to deal with those problems]. Those problems and the timing loss that they entail are the result of using push linkage. To prevent that loss, you need to use synchronized [pull] linkage.

“You’ve got to remember that the purpose of automation is to raise profitability for the company, not to make things look pretty. The guys in production engineering sometime automate stuff for the sake of appearances. Sometimes, they automate stuff just for the sake of automation. The right way to automate is to start by doing thorough kaizen in the processes as they are. Then you automate just enough to achieve what you need above and beyond what the processes are capable of delivering otherwise.”

10. Rationalization

Ohno-san would get angry when he saw workers running around and working up a sweat. He’d say, “What’s the big hurry? Mistakes happen when people are rushing back and forth like that. You’re making a huge mistake if you think that a lot of running around means that people are doing a good job. You’ve got to arrange things so that people can get their work done more easily.”

Rationalization is a matter of arranging things so that your equipment and your people can generate value-added continuously and efficiently.

A workplace where rationalization has been done right doesn't look that way to the untrained eye. Amateurs assume that a rationalized workplace is one where you see lots of automated equipment and where everyone looks really busy. That's not true rationalization.

[Ohno-san also warned us not to let automation detract from rationalization.] “When you install automated equipment, you need to position it so that fluctuations in production volumes don't result in awkward increments of work. Automated machines tend to become bottlenecks when production volumes fluctuate. Let's say that a one-minute cycle becomes a two-minute cycle. If you've got one person working between two machines, you could end up with just a half-person's worth of work for that person to do. You've got to position your equipment and your people to avoid that kind of problem.

“An increase in production volume shouldn't necessarily mean a decline in unit costs any more than a decline in volume should mean an increase in unit costs. Those sorts of things happen as the result of arranging things poorly.”

11. Other Ohnoisms

“Machines are there for people to use, not the other way around.”

“Some people love to make things complicated. The key is to make things simple.”

“A lot of people think that rationalization means turning out more stuff. In fact, the essence of rationalization is turning out better stuff.”

“Attaining a target doesn't mean that you've finished anything. Targets are just tools for tapping people's potential. When you've attained a target, raise the bar.”

“Learning from mistakes is common sense. You also need to learn from what you've done when you're successful and put it to work in tackling

new challenges. When you've just attained a target, that's no time to pat yourself on the back and relax."

"Do things that no one else is doing. Your efforts might not come to anything, but if they do, you need to learn from the process, too."

"The way you evaluate people shapes their behavior. Production at the Takaoka Plant slumped one time [on account of weak demand], and the plant was operating only half days. At times like that, the people should simply take the rest of the day off. But when I went to the workplace, I found the lights on and people sweeping up and getting ready for the next shift. I noted that they were wasting electricity and asked what they were doing. They answered that their evaluations would suffer if they weren't doing something that looked like work all the time. When you've got idiots for managers, people in the workplace end up wasting money."

"The right approach to maintenance is to keep your machines and equipment in perfect condition and make repairmen unnecessary." [Tanaka: The maintenance guys at Toyota would hang out in a room during the day and play mahjong. Someone mentioned that to Ohno-san, and he responded] "It's a good sign if your maintenance guys can sit around and play mahjong. You're in trouble if they're busy running around. [If your maintenance guys can sit around playing mahjong] that means you're doing a good job [of keeping your machines and equipment in the right condition]."

"The ultimate criterion is cost. In deciding how to proceed, you make your decision on the basis of cost."

"If you think there's no alternative, you're just failing to see the other possibilities. If no one [disagrees with you and] comes forward with a different idea, then come up with an alternative on your own. You need to understand the alternatives before going ahead with anything."

"You need to stop the line if a defect turns up." [Tanaka: We established a reworking process one time to deal with defects. Ohno-san

scolded us, saying] “You get defects because you set up a process like that. If a defect occurs, stop the line. That way, everyone will do their best [to prevent defects from occurring and, when they do occur, to determine the causes and take countermeasures]. You don’t want to be setting up a separate process to rework stuff.” [*Tanaka*: People working hard on the line don’t necessarily notice defects naturally. So you need to stop the line when a defect occurs and show people what has happened and why. That teaches them how to avoid creating defects. It’s a lot better (than resigning yourself to the occurrence of defects and letting a reworking process deal with the problems).]

“Set things up so that production cannot continue when a defect has occurred.” [The president of a company in Kyushu that made a certain product came to consult with Ohno-san. His company recovered unsold products and recycled them into new products. (The main reason for the unsold products was defects, and) the president was interested in reducing the volume of returned products. He sought advice from Ohno-san about how to proceed.] “You can’t reduce the volume of returned products as long as you keep recycling them. Do you have a place at your factory where you could dig a hole to bury the returned products? If you really throw away the stuff that comes back, your people will see what a terrible waste it is. That sense of waste is crucial.”

“Telling lies is bad, but being fooled by lies is worse.” [*Tanaka*: Making decisions on the basis of written materials can produce bad decisions. If you’ve got doubts about something, you need to go to the workplace and see for yourself. The president at a company came from an administrative background, and he couldn’t determine what was what when a technical issue arose at a board meeting. So he went to the workplace to see what the problem was. He discovered that half of what a director responsible for production had said at a board meeting was untrue. The president started visiting the workplace occasionally. Word got around that he was

keeping an eye on things, and the directors stopped making false reports.] “Managers and general managers are good liars. But directors are even better.”

Conclusion

I urge all of you to maintain a sense of urgency. Ohno-san had a sense of urgency, and that’s why he came up with the idea for kanban after seeing a U.S. supermarket. Anyone can gain knowledge through study. But wisdom is something else again. And what we need in the workplace is wisdom. We need to foster people who possess wisdom. The only way to do that is to set our goals high and force people to accomplish more than they might have thought possible.

Once people really resolve to do something, the necessary wisdom arises. The people grow, and they assert new capabilities. The kanban didn’t arise from textbook learning. It arose from practical experience in the workplace, and the best way to learn about kanban is to use them. Ohno-san told us, “Books are appearing about kanban, but only someone who actually uses kanban can really understand how they work. You guys have learned about kanban by using them, so you don’t need to read my book.” So I never did read his book.

Ohno-san was a man who defied the conventional wisdom. He devoted his life to kaizen. He kept finding new things to improve and new ways to do kaizen. You need to avoid thinking that the present way of doing things is the best way. You need to be eager to change things. Everything begins with trying something. Without that determination to try something, all the knowledge in the world is useless.

If you got anything at all today from my comments about Ohno-san, then please try putting it to work. Different companies have different ways of doing things, and no single system is the best for everyone. Different

factories will naturally have different approaches. But what we need to do everywhere is create a sense of tension and to motivate people to get things done.

Questions and Answers

Q: You say that you were dubious about the kanban at first? Why were you doubtful?

Tanaka: I just didn't understand it well enough. I couldn't see the connection between reducing in-process stock and doing kaizen. Only after we tried it did I see how reducing in-process stock highlights problems. I had figured that we could simply change the processes to make the necessary improvements. And Ohno-san never explained his reasons, so the only way to learn was by doing. Nothing was clear to me at first, so I doubted that the kanban would really work.

When I joined Daihatsu, I went straight to work in production engineering without ever having worked on the plant floor. That was unfortunate. I should have gained some hands-on experience in production first. Then I could have been more useful to our production people when I worked in production engineering.

Anyway, my first job was in production engineering, where I participated in planning a new plant. I went to work in production when the new plant opened. Only then did I realize that I had been a "catalog engineer." I had simply collected catalogs and other materials and looked at the pictures and decided that I wanted to make this or that. Of course, some of what I did was useful, but it wasn't in tune with the expectations of our production people. What they wanted was a working environment that made work easier to do. If I had been more aware of circumstances in the workplace, I could have come up with better layouts.

Eiji Toyoda was a person who truly enjoyed spending time in the workplace. When he arrived at a plant, he'd head straight for the shop floor. I showed him the automated line at our new Shiga Plant when he visited one time. He said, "You guys are just dragging me around to show off your automation." He saw right through us.

Most corporate types who came to the plant would compliment us on our impressive new facility and on all the fancy equipment. But Eiji was looking carefully at the relationship between the equipment and the people. He told us that the matching was lousy between our automated machines and our people. He meant that we wouldn't be able to respond flexibly when production volumes fluctuated and that work loss would occur as a result. You can't afford to focus exclusively on your automated equipment. A line of impressive-looking machines is not necessarily a good thing.

Q: I'm responsible for a production line. I have been careful in deploying people, and I have eliminated inventory buffers so that the line stops immediately if a problem occurs. But we keep having problems with dumb mistakes. I'm not making any progress in tackling this problem, and I'm getting really frustrated.

Tanaka: Humans are imperfect animals, so mistakes happen. Work is a combination of processing and checking. In crucial processes, you need to incorporate and enforce checks to avoid mistakes that would place the employees at fault. Workers naturally tend to forget things and to become careless. I assume that you are already doing this, but you can help prevent mistakes by detailing important processing steps in the standardized work manual and by having your people check themselves against that sheet.

Q: I prepared a collection of Soichiro Honda sayings in connection with the evolution of production engineering at Honda [Motor]. What he said resonates perfectly with what we have heard from you, and everything makes perfect sense. A love for making things seems to be the common thread.

Soichiro Honda was originally infatuated with making tools for making cars that would evoke [the beauty of] production engineering, and he would make a beeline for the shop floor whenever he came to a plant. His passing has underlined the importance of conveying that spirit to the next generation, but imparting that spirit to new employees is hard. What suggestions do you have for passing on the spirit that you have been discussing?

Tanaka: The example set by management is important. If management sets a bad example, the people down below will let things slide. If you're going to tackle the challenge of rationalization, someone's got to take charge. People who achieve great things, including Honda-san, have some important things in common. They tend to display a *genchi gembutsu* commitment to the workplace, and they tend to believe only what they can confirm with their own eyes.

I remember watching the great film director Akira Kurosawa on a television show. He was describing what he had learned while working as an assistant director under Kajiro Yamamoto. Kurosawa recalled walking out of the studio with Yamamoto and passing an actress dressed in a kimono and carrying a pouch. Yamamoto asked him what she was carrying. He wasn't sure and said something like, "Isn't it a medicine pouch?" That earned a scolding from Yamamoto. "Don't try to BS people. If you don't know the answer, don't say anything until you can find out for sure."

Kurosawa then became a *genchi gembutsu* person [a person committed to seeing things firsthand as they really are]. His *genchi gembutsu*

commitment is the same thing that we require in manufacturing. The most important thing for people in manufacturing is to keep one foot in the production workplace and take a good look at things there before making decisions. People who excel at anything tend to be people who insist on seeing things for themselves. That's because the facts are in the things that we can actually see, and we can only get at the truth through the facts. Just thinking about things in your own head won't [lead you to the truth].

The way to pass this spirit on to the next generation is to go out into the workplace and scold people. If someone screws up, take them into the workplace, show them exactly what's gone wrong, and give them a good scolding. When someone gets a scolding in the workplace while looking at what's actually happened, they can't make any excuses. The scolding presents the person with a higher standard to meet.

On the other hand, you can't be strict all the time. Ohno-san cautioned me one time after I'd been scolding people in the workplace. "You need to be careful not to discourage people who already have the right motivation." I asked him what he meant, and he replied, "Motivated people want to do things, even when they think they can't. And some things really are impossible for some people. At times like that, motivated people can get discouraged. So even if you say something strict, you also want to find an opportunity to extend a helping hand."

Extending a helping hand lets people know that you value their effort, even if they were unsuccessful. [Managers] who never extend a helping hand can never earn the trust of their subordinates. We need to accompany strictness with a readiness to help. And to do that, we need to know what's going on in the workplace. If you don't know what's happening in the workplace, you can't do anything for the people there.

Managers who are happy when problems stop showing up and operating rates rise are no good. Managers need to let their people know that

they're happy to see problems show up. Ordinary people tend to want to hide problems. We shouldn't ever think badly of people who reveal one problem after another. We should welcome situations where problems become clear.

When Ohno-san gave guidance to companies, he always started with the president. "All the training in the world will come to nothing unless senior management displays a strong commitment. If you demonstrate the right commitment, I'll provide your people with the training they need."

Q: At [what is now the Toyota subsidiary] Kanto Auto Works, a lot of the engineers were from Nakajima Aircraft [which was Japan's premier manufacturer of aircraft and which was disbanded after the war]. That engineering tradition entailed a lot of conflict between the product engineers and the production engineers. I'm interested to know whether or not the situation there was different from what you've discussed in your talk today.

So I have two questions. One, are the people you describe who love to rationalize systems different from the people who simply love to make things? I see that as a difference between Soichiro Honda and Taiichi Ohno. My second question is about those people who just love to work, regardless of what's happening in regard to targets. When people like that clashed with Ohno-san, how did he set them right?

Tanaka: I never received any guidance directly from Honda-san, so I can't comment with confidence on the difference between him and Ohno-san. My gut feeling is that Honda-san and Ohno-san had similarities but that they were basically different. Honda-san participated directly in creating products. Ohno-san was more interested in fostering human resources and in creating systems, but he devoted himself to the practical side of those challenges, not to the theoretical side. As a result, a lot of people

grew and developed through receiving guidance from Ohno-san. Their way of thinking came to resemble his way of thinking.

Q: I am studying that subject carefully, and I have obtained some pertinent materials from Honda [Motor]. I've learned that [Soichiro] Honda also devoted a great deal of attention to fostering human resources. If you want to get any work done right, you need to spend a lot of time on that task. Honda-san could never have achieved such impressive success if he had ignored the task of fostering human resources.

What emerges most clearly in the materials I've obtained is [Soichiro Honda's] emphasis on motivating people and on encouraging people to tackle self-improvement. If those materials all became public, they would highlight an important similarity between Honda-san and Ohno-san. I think that we need to take another look at the two men's approach to manufacturing.

The message in your talk that resonated with my experience was that nothing happens unless management demonstrates a strong commitment. I was at Kobe Steel, and I spent a year supervising [what should have been] a thorough rationalization of operations at the Saijo Plant, near Hiroshima. The plant manager was dead set against our efforts.

I secured a strong show of support from the company president. He declared that he would fire anyone who stood in the way of our efforts, even the plant manager. That changed everything. I went into that assignment without any relevant experience, and I learned a lot about the deep-rooted resistance you encounter on-site when you try to reform factory operations. You've got to listen to people in the workplace, but you've also got to push ahead with new ideas [and new ways of doing things].

Tanaka: You're absolutely right. You walk into an old plant and tell someone that they've got to change the way they do things. They'll tell you,

“I’ve been doing things this way for 20 years, and it works just fine.” I answered like this: “If you’ve been doing things that way for 20 years, don’t you think it’s time for a change? Can’t you see that doing things the same way for 20 years means that you’re not making any progress?” People’s own wisdom and experience don’t necessarily highlight the need for change.

Another issue is differences in how people perceive the appropriate goals. I was anti-kanban at first, and that was because I didn’t understand the aims of the kanban system. Circumstances later provided me with the opportunity to understand those aims, and I went to work [on putting the kanban system in place and making it work]. Different perceptions of suitable goals can happen like that when people haven’t had the chance to come to terms with what you’re trying to do.

Q: You describe putting in place [what some people called] the New Production System. I understand that you and others set up the system at 37 or 38 companies. The guiding principle appears to have been to rationalize plant operations without spending any money and to defer any large-scale automation as much as possible. You determined what resulted in the smoothest flow. And after you had simplified the flow as much as possible, you automated what you had at that point.

I’ve been listening without really understanding fully what you were saying. I’d be interested to hear what you went through before arriving at that approach. Once you arrived at that approach and everyone understood how things would proceed, I assume that you didn’t have arguments about whether or not to automate things. Were you still operating in a kind of flux?

Tanaka: We definitely felt like we were proceeding in a state of flux when we were first putting the system in place. An operating procedure

ultimately took shape, but that was maybe five years down the line. Clear criteria for automation came even later. The mood of the times presented a lot of pressure to automate and to computerize, and our younger employees were impatient. We lost some people then that I felt bad about losing.

Q: Tell us more about the initial resistance to the kanban system.

Tanaka: That was only natural. You can't understand the kanban system until you give it a try. When you just walk in and tell people to start using kanban, they're bound to resist. It's something that you learn by doing. I could easily have ended up on the outside looking in. I only stuck with it because I happened to get the chance to see how [kanban] could work.

I didn't think at the time that any particular method was the be-all and end-all, and I still don't think so. What matters is motivation. You need to start by motivating people, by getting them excited about accomplishing something. Once you do that, they'll be happy to learn and use whatever method you propose. The kanban system is simple. But unmotivated people will not learn the system. The motivation has got to come first.

Q: At Toshiba's Omi Plant, they were making desktop computers on two 20-meter-long assembly lines until two years ago. They got rid of the conveyor lines and started having individuals assemble whole computers. I was amazed. Productivity doubled. That's because a conveyor line ends up flowing at the pace of the person who has the lowest productivity. A veteran assembler can put together about 50 computers a day. And putting individuals in charge of assembling complete computers reduced the in-process stock dramatically.

I know of lots of similar examples. And that trend is narrowing the difference in productivity between low-wage small companies and high-

wage big companies. The only thing left to differentiate a company is motivation. I think we've entered an era when [the people at] big companies can't take anything for granted.

Tanaka: Small companies that assert unique strengths have high profitability. They do things that big companies aren't doing. Their people operate outside the organization-man mentality. Niche strategies can work.

Q: I have a question about your story of Eiji Toyoda pointing out a mismatch between people and automated equipment. We are in an era of violent fluctuations in demand. What kind of operating rate is reasonable to aim for in matching people and automated equipment?

Some mismatching is inevitable, but the degree of the imbalance depends on your priorities. Has kaizen produced an ideal allocation of human and mechanical resources at Daihatsu? And what is the logic behind the allocation that has resulted there?

Tanaka: If you were operating a line entirely with human labor [and with no automated equipment], fluctuations in production volume wouldn't affect your productivity a bit. If you install automated equipment and position individual workers between machines, you can't reduce the staffing [when the production volume declines]. You've got to arrange things so that one operator can [operate a broader or narrower range of equipment, depending on the production volume].

In general, installing highly automated equipment means an increase in unit costs when the production volume declines. A strong and inverse relationship between unit costs and production volume indicates a bad approach to manufacturing. Fancy equipment tends to raise unit costs.

Toyoda Boshoku [now Toyota Boshoku (Toyota Spinning and Weaving)] once assembled vacuum bottles for [a consumer products company], and

it wasn't making any money at all from that business. It was assembling the vacuum bottles on a conveyor line when Ohno-san became the chairman there [after retiring from Toyota]. So you'd have spells of waiting between people on the line, and you'd end up working at the pace of the slowest person. Ohno-san got rid of the conveyor belt and had the people do their work standing [alongside a workbench]. Productivity went up 30% or 40%, and Toyoda Boshoku finally started to turn a profit on the vacuum bottle business.

Yes, the era of the conveyor as the be-all and end-all is over. We can discard the assumption that mass production is synonymous with conveyor lines.

Q: My question is about how the production engineering sector should support the kaizen efforts by people in the manufacturing workplace. You've mentioned progress in computer technology, and the production engineering people are presumably supervising the creation of advanced systems. Meanwhile, the people on the shop floor are pushing ahead with the [practical] ideas promoted by Ohno-san. How do those different efforts interact?

Tanaka: Creating systems needs to be a matter of going out into the workplace, seeing the problems that are occurring there, and developing systems [to address those real-world circumstances]. You won't get far in the workplace with systems based on ideas that you've simply dreamed up in your head.

All [good] systems originate in the workplace. Ohno-san wasn't consciously working on any system at first. He was simply [solving problems] and ended up creating a system. A system that someone just dreams up [in an office or somewhere] won't work in the production workplace. If anything, it'll trigger a backlash.

Q: Product development engineers are showing up increasingly on the plant floor these days, along with the production engineering people. That seems to be a trend, doesn't it?

Tanaka: The development people also need to abide by the *genchi gem-butsu* principle of seeing for themselves in the workplace. They need to see for themselves if the things they've designed are truly easy to assemble and whether the quality [of the assembled products] is what they envisioned. That kind of attention results in higher quality and lower costs.

We say that providing management with information feedback is the job of the production workplace. Conversely, management is responsible for absorbing information from [the plant floor]. Amazing things result when both ends of the flow fulfill their responsibility. Things get out of whack in the workplace when a know-it-all comes along [and starts spouting off].

Q: Kanto Auto Works acquired the Toyota Production System in bits and pieces. At Toyota, the system extends all the way from sales to product development, manufacturing, and purchasing. But at Kanto Auto Works, a new idea that took hold in the plants didn't have any effect on product development. Instead, product development would absorb some idea from Toyota. So even if the Toyota Production System was transforming operations in the plants, the basic approach to product development didn't change. You must have had a similar experience at Daihatsu. How did things play out at your company?

Tanaka: Here is an example of something Ohno-san did to prevent that sort of problem. He instructed us to report the number of parts shortages that occurred [when the flow-based production line stopped because of a

work delay in any process on the line]. Ohno-san told us to leave everything else up to the people on the shop floor. The people in the production workplace got in trouble when parts shortages occurred, so they worked hard on kaizen improvements to prevent shortages.

Ohno-san also told us to have the quality assurance people play a more-active role in managing flows of information [among the processes and among the different sectors of operations]. And he laid down a general rule for everyone to follow: “If you come out to the workplace with nothing better to do than complain, then stay away. If you have a positive suggestion about ways to maybe improve things, then come.”

In the relationship between sales and production, Ohno-san told the production people to make more stuff because things were selling well. And he told the salespeople to sell more. But he knew what our production capacity was, and he never insisted on pushing production to an unsound level just to keep up with strong sales. He knew that putting unreasonable pressure on the workplace would simply cause problems, and he cautioned us, “You’ve got to maintain quality. Making unreasonable demands causes quality to deteriorate.”

Ohno-san carefully managed any discrepancies between the number of vehicles that the salespeople were demanding and the number of vehicles that we could reasonably produce. That earned him the absolute confidence of the people in manufacturing. They accepted anything he said as the truth.

Q: At our previous gathering, we heard from [Masao] Nemoto [a former senior managing director at Toyota (see chapter 5)]. He led the introduction of TQC at Toyota, and he told us that the Toyota Production System and TQC complemented each other [and had both been essential to Toyota’s progress in raising productivity, ensuring quality, and lowering costs].

Nemoto-san observed that the Toyota Production System gets a lot of credit [for Toyota's success]. And he noted that people have forgotten that TQC was indispensable, for example, in putting the kanban system in place. What was the positioning of TQC in the guidance that you received from Ohno-san?

Tanaka: Ohno-san always said, "Kanban won't work right anywhere that TQC isn't working right. Quality control is fundamental. The kanban system only works when you're making quality products."

The main difference [between Ohno-san and some of the proponents of TQC] was his dislike of written materials. He warned us not to waste time producing useless documentation. He insisted that we could convey information better by showing people the workplace than by turning out documents.

Ohno-san said, "Supervisors and managers should go 'read' the situation in the workplace when the line stops. They shouldn't waste their time gathering data. When a defect occurs, stop the line and go see what's happened. That's the way to discover the causes of problems. What good is preparing a bunch of data?"

He also said, "If you deal with problems on the spot when they occur, the person responsible for the problem will understand what he or she has done wrong. If you simply gather data and pass it upstairs, no one will feel any sense of personal responsibility when the report comes out. You've got to make people feel responsible for their mistakes. You need to maintain a healthy sense of tension [in regard to preventing defects]."