

# *In the Process of the Challenge, and the Use of the Jidoka Concept*

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**W**hen I was asked to write an article for *Target*, the requested topic was on "new" movements in JIT, particularly in Japan. After having been exposed to books, articles, and seminars, readers may search for new thinking or techniques. However, instead of writing something "new," I felt it more important to qualify the points which are the foundation of our thinking. Without this process, we may be aiming at the wrong target.

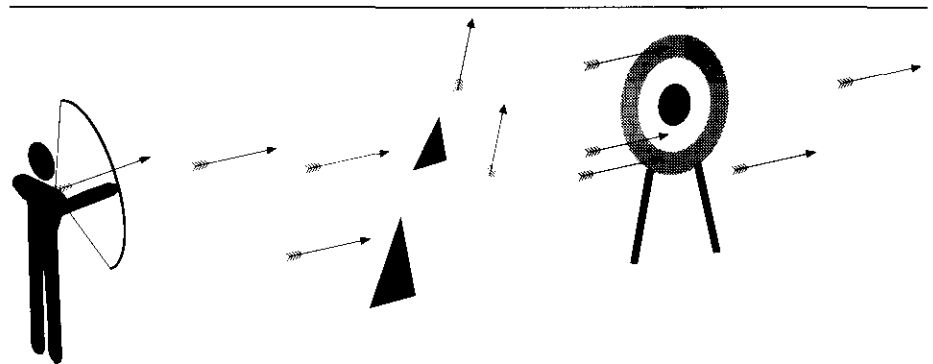
As this publication bears the name "target," the term has a special connotation. A person may set an individual target, but when a number of people share the same target, they develop a sense of vision, commitment, and shared understanding.

What then is the target for us? Is it to produce required products, at the required time, in the quantity required with highest quality at lowest cost? Is it a challenge to continuous improvement? Or is it simply the elimination of waste?

For some people, making money is the target. For others, it is survival. While I am not in a position to set a target for others, it is my desire to introduce some ideas to meet the challenge for manufacturing excellence—my viewpoint on a few fundamental issues of JIT manufacturing.

## **Overcoming Difficulties**

Many people are examining



*Fig. 1. Aiming for the target.*

how JIT may be applied in their company. Initial application of techniques typically brings some successes and some failures. Those who succeeded in overcoming difficulties here and there find still tougher walls in front of them. Strong momentum may have existed at the beginning, but marginal gains from JIT activities seem to decline as time goes by.

While a lack of technical understanding may prevent progress, often the walls are found within ourselves. For example, there is no interest generated among the people involved to attack a problem, or complacency spreads that we did our best, or we simply think a problem is others', not our own.

Even though there are obvious areas for improvement in front of our eyes, we may not be able to address them because 1) we question how good is good enough, or 2) we conclude that we have tried all the

techniques we have read in the book or heard at the seminar, etc. This is the time to reaffirm our target.

A top-level manager once told me that he was satisfied with the 70 percent reduction of inventory achieved by implementing JIT. Isn't the inventory level after the improvement still too high? Is this person satisfied not to make his business more competitive?

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Whether we can reach a target depends on our understanding of the subject, commitment, level of expectation, and vision. Without vision, we may not be able to find a path

even though there is one. With vision comes the mindset that empowers achievement.

Let us, then, look further into the way we typically think. For example, we may think:

1. Inventory and setup time cannot be reduced any more.
2. Machine breakdown and defects cannot be further eliminated.
3. Capacity of people and machines cannot be increased any more.
4. Job descriptions and people's attitudes cannot be changed, etc.

If we are to lead JIT activities, however, we must overcome this mindset and establish commonly-shared beliefs. Only with meaningful action and commitment can we communicate our vision and generate cooperation among all involved.

### Creative Disruption

JIT strives to best utilize the limited resources of man, material, machine, and money, without generating waste in conducting a company's operations.

The *process of progress* may be characterized as "creative disruption." Only by breaking down the old system, structure, and mindset do we have a chance for progress. The ultimate measure of progress in JIT is substance (the bottom line)—not form. Superior performance, when sustained or further enhanced in the long run, reflects the fundamental changes and constant challenges made in the way the business is conducted.

While many of us may be comfortable learning JIT techniques and terminology, we should be careful not to confuse the means with the ends. Techniques, knowledge, and terminology are helpful. Simply learning and practicing techniques is not enough if we are to accelerate our learning and obtain new insights. We need to maintain a much broader perspective and in-depth understanding of the subject to move us forward.

Our goal is not to introduce techniques just for the sake of it, and then to call it JIT. We should be "needs" driven rather than "technique" driven. We should keep asking "why," not just learning "how."

The logic of why and how cer-

tain techniques work needs to be examined and challenged constantly. Even though developing a logical foundation is quite important for our progress, we should not be constrained by the logical framework developed yesterday. Just as techniques should be improved and the organization changed to meet today's economic needs, we should constantly challenge the underlying logic as well.

The progress of JIT by Mr. Ohno of Toyota in the last half-century was based on a constant challenge to the status quo and continuous experimentation with new ideas. We may benefit from incorporating the spirit of his challenge and his drive to creatively disrupt the

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status quo in our *process of progress*. JIT, as we find it in front of our eyes, is by no means a completed system. Rather, as Mr. Ohno would agree, we should keep striving to develop a better system. To me, this is one of our most important duties.

### The Eighth Waste

In the early 1970s, Toyota emphasized for employees the elimination of waste and its commitment to battle waste. The company introduced the idea of eliminating the seven wastes: overproduction, waiting, transportation, processing, inventory, motion, and product defects.<sup>1</sup>

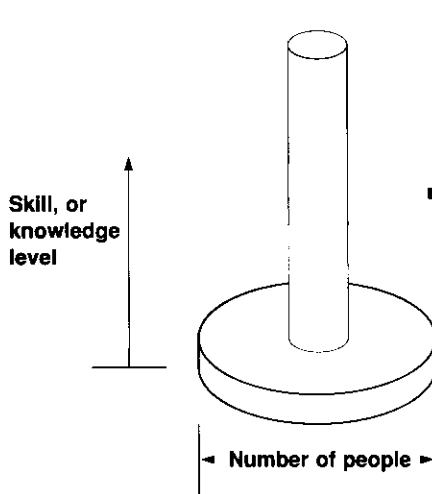
Observations of companies in Japan, the United States, and Europe indicate that one fundamental point behind these seven wastes is often ignored. Therefore, I would like to add an eighth waste—the waste of "not utilizing people's potential capability."

Focusing on purely technical issues overlooks the importance of this eighth waste. If our orientation is *not* on increasing the capability of people and the way each of us contribute, we may miss the whole point. Systems make it possible; people make it happen. And after all, isn't it true that every person can make some kind of system, whether it is big or small?

In practicing JIT, the key to ultimate success is people, their awareness and understanding of the subject matter, their expectations, and their teamwork to make the system work and improve. This success is

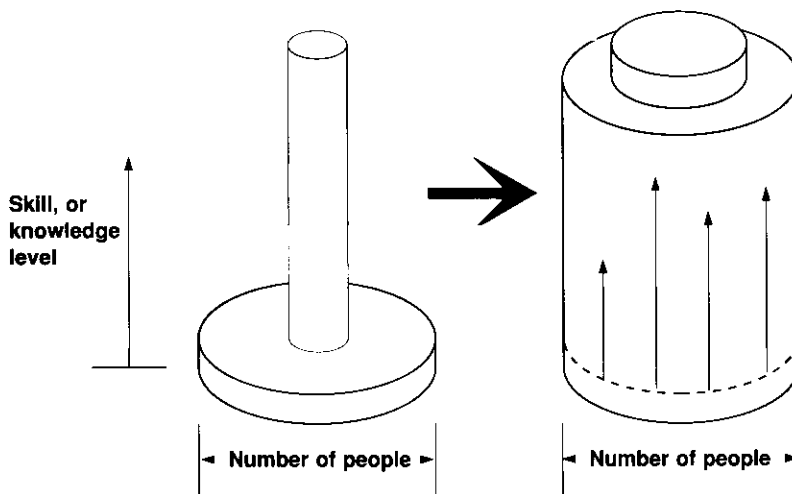
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### Centralized organization



Small number of people possess skills and knowledge, and they direct low-skilled people. For the most part, people's capabilities are not well utilized.

### Decentralized organization



Large number of people possess skills and knowledge. Because of their increased capability, they are more self-controlled, self-thinking, and self-motivated.

Fig. 2. Comparison of centralized and decentralized organizations.



not by any means a small success or collection of small successes achieved by the introduction of "techniques." The biggest success is minimization of the eighth waste so that people's capabilities are utilized to their fullest degree. In that sense, we should realize that the process of creative disruption equally applies to the process of each person's growth.

Fig. 2 conveys that each person's effort to upgrade his or her skills provides the foundation for developing a sustainable competitive advantage for the organization. If a small number of people "monopolize" skills, knowledge, and authority in a centralized organization, management and staff people will be overburdened issuing directions, orders, and schedules. Also, there will be "under-utilized people's potential capability."

It is for this reason that developing an effective mechanism to facilitate capability gains and the sharing of burdens through teamwork becomes one of the most important factors for long-term success for a company. The energy and capability of people intricately tied into the company's system are difficult for competitors to copy or take away.

### **Jidoka**

One of the most intriguing aspects of JIT at Toyota is the strong emphasis on enhancing people's capabilities, using their wisdom, and developing mechanisms to accomplish these things. In other words, a fundamental principle of JIT is to develop mechanisms which help eliminate waste and at the same time enhance people's capabilities. Broadly defined, this is the Jidoka or autonomous control (autonomation) concept.

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Jidoka is to manufacturing what disciplined exercise is to the nervous and muscle systems of our body. As we increase our athletic

skills through training, our body eventually responds to necessary changes much more quickly and accurately than before. Just as in sports competition, there is a need to train ourselves in manufacturing to compete and survive. But how we can effectively practice this Jidoka concept is clearly the challenge.

One example of Jidoka is the Line Stop Concept. A line or machine stops whenever an abnormal event happens. At the same time, an Andon (trouble light) may light up and a buzzer may sound to inform others of the incident and to ask for a supervisor's help. The information shared by this simple mechanism may include when, where, and why it happened, as well as who can—and how to—help resolve the situation.

When the line stops, it triggers quick action to resolve the problem and regain the normal operating condition. In other words, with this mechanism, we are committing ourselves to satisfy the specific needs of customers (internal customers in this case) as quickly as possible.

If there are a number of similar events over time, this mechanism will almost automatically bring people to work together to solve the problem—*autonomously*. These people who are directly facing the problems can use their collective wisdom to fix this situation and benefit from the outcome. When people have appropriate "knowledge" and an immediate "need" to restore the normal condition as triggered by this mechanism, they *will* develop a solution.

The Line Stop example illustrates the use of Jidoka to increase people's capability in the continuous improvement drive. Other Jidoka mechanisms help to develop improved nervous and muscle systems in the factory. Poka-yoke (a fool-proof mechanism) is an example of Jidoka where a self-correction mechanism is developed at the operation site, rather than anywhere downstream from the process. Tools for visual control such as Andon, Kanban, production control boards, standard work instruction sheets, or maintenance checklists displayed in the shop also may be considered examples of Jidoka. Each one facili-

tates quick action when required.

These tools are useful in developing an effective nervous system within the organization to keep itself healthy. As certain abnormalities or problems may induce repetitive "pain," we learn lessons to eliminate them. In this process of progress, we should upgrade our problem-solving skills and gain confidence as the solution is being developed. The accompanying pains should be bearable, and they should not be ignored by management when further support is needed.

If we understand these points, the role of manager should be to 1) monitor the levels of abnormality, pain, or problems in the production schedule, quality, or machine breakdown during the normal operating condition, 2) monitor these symptoms as we reduce the number of Kanban cards or the number of operators on the line, etc. and 3) provide solutions to the exposed problems or to improve the mechanism to facilitate progress. This description may seem to match the management by exception principle. The key difference is much faster feedback and wider development of *all* people throughout the company's operations.

The fundamental belief behind these practices is that there is no limit to our wisdom. Therefore, continuous improvement is always expected and sought. Depending on the level of the individual's capability, we need to develop appropriate mechanisms so that problems are exposed as soon as possible, solutions are developed, and hence, new standards are put in place to keep the process of improvement going continuously. As these mechanisms help people to use their wisdom, we need to use our wisdom to continue the development of such mechanisms when appropriate.

### **Process of Change and Its Impact On the Organization**

As people increase their skills and the level of control in the organization increases with the application of Jidoka concepts, the relative importance of techniques and areas of focus will change accordingly. For example, as the process stabilizes, the meaning of Statistical Process

Control (SPC) charting should be changed. The number of Kanban cards may be reduced, replaced by other means, or possibly even eliminated. Although a production control board may provide valuable information on hourly production volume — indicating potential problems influencing production — recording numbers on the board may become a waste of time once the control level is increased in the area.

Such change is simply a necessary process for improvement. Those who lead the practice should be on top of these changes. Naturally, different techniques, tools, and mechanisms may apply at one time or another, depending on the level of control. Also, companies with different production characteristics may benefit differently from the same techniques.

In order to make changes effectively by incorporating people with the Jidoka concept, there are a few points worth summarizing:

1. Persons in charge of operations (operators) should satisfy their customer's needs (that is, the next process) in cost, quality, and delivery according to the prescribed standards. Naturally, this practice of following the standard procedure requires discipline.
2. Persons at a higher level (that is, supervisors) should understand the broader aspects of operations and solve problems exposed from the procedures currently in place. Without standards, we can see no abnormality. If standards are not practiced by subordinates, the supervisor is not fulfilling his role.
3. Persons at the next higher level (that is, production manager) should have an even broader knowledge, balanced perspective, a higher level of commitment to achieve goals, and the ability to lead the organization toward such goals. This person should be able to develop or introduce new standards on Jidoka mechanisms into the organization and make sure each procedure, standard, and mechanism is well maintained.

The organization mentioned above has three layers of hierarchy,

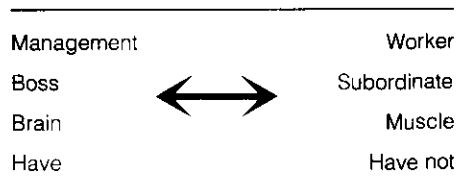


Fig. 3. Traditional structure of dichotomy.

but note that as everyone improves his or her skills, operators may contribute a great deal by developing new standard procedures, solving problems, or even developing new Jidoka mechanisms. A natural result of the increase in people's capability and in-depth understanding should be a continuous change in the organization. The number of layers may decrease as a natural consequence.

People may fear losing control in eliminating a layer of the organization, or any change in their responsibilities. Vision, commitment, and shared understanding of organizational goals should overcome fear. If we cannot drive out the fear of change, our own mindset has created walls to prevent our progress. (See Fig. 3.)

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We also should see changes in the horizontal structure of an organization as we apply such techniques as Kanban, product-oriented layouts, U-shaped lines, multi-process han-

dling, mixed production, mixed loading truck for multi-plant transportation, and single-source supplier arrangements. Better material and information flow across the organization will reduce or eliminate the previously existing barriers between organizations. (See Fig. 4.)

Instead of locally optimizing one's organization, these tools help tie different operations and organizations together, reduce total product costs, and make systems more responsive to customers' needs. To do it, everyone must understand the broader aspects of operations. This understanding, in turn, leads to changes in the organizational structure and people's responsibilities.

Just as Jidoka emphasizes quick exposure of problems and creation of autonomous action to solve problems, techniques such as Kanban or product-oriented layout are also considered examples of autonomous control. They contribute to early detection of problems, quick communication, and, hence, the elimination of waste. As mentioned before, we should be "needs" driven. Organizations should simply follow economic needs, or else they will not survive.

**Self-controlled, Self-thinking, and Self-motivated Organization**

If we share these points, the organization should move toward being self-controlled, self-thinking, and self-motivated. Material and information move smoothly. People do things as needed. Quick exposure of problems initiates needed problem-solving activities.

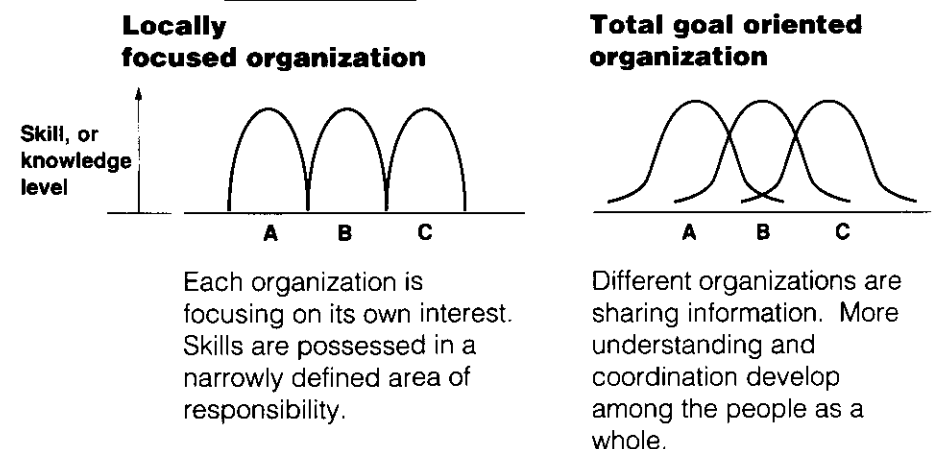


Fig. 4. A comparison of total and local optimization.

Improved systems or mechanisms should replace antiquated systems to upgrade customer service capabilities. Whether customers are internal or external, we first need to understand their needs, and then to develop necessary techniques or organizations for meeting the needs—not the other way around.

To managers or staff people, operators should be viewed as customers. From the operators' point of view, the next process should be viewed as their customer. In order to let upstream or support people know the specific needs of customers, we need systems such as Kanban for communicating production information, or Andon (a trouble light) for requesting a supervisor's assistance. As we satisfy their needs better, faster, and at lower cost through better systems, the better the whole operation will become.

#### Examples: Improvements in Process

An example is a suggestion program: Typically, the feedback to any suggestion in most companies takes too long. Our customers (operators) are, in most cases, capable of doing the job better given the appropriate environment, but if we do not respond to their suggestions quickly, what are their feelings toward improvement?

To apply the customer relationship internally, we need to put ourselves in the operator's shoes and find better ways to satisfy their needs. Whatever suggestion system we have, we should make the evaluation and feedback system follow the needs of our customers. To me, Fig. 5 dramatically indicates the differences between United States and Japanese approaches to suggestion programs.

A second example relates to preventive maintenance: I have seen sophisticated computer programs to collect data—by machine, time, operator, location of trouble, symptom, etc., to analyze the nature of machine breakdowns and to develop corrective action. But we spend a lot of time entering data into a computer, accumulating the data before doing analysis. If we re-

### Comparison of Suggestion Programs in Japan and the United States (1985)

	Japan	U.S.
(A) Participation rate (%)	60%	13%
(B) Number of suggestions per person	24	0.14
(C) Adoption rate (%)	82%	25%
(D) Average award per suggestion	\$ 3	\$ 398
(E) Average saving per suggestion	\$ 118	\$4397
(F) Saving per suggestion + Award per suggestion	3900%	1100%
(G) Total saving minus total award granted for 1000 employees company- (hypothetical calculation)	\$2.8 million	\$0.6 million

Fig. 5. Sources for this comparison are: (A) through (E) from Japan HR Association; and N.A.S.S. Statistics; (F) and (G) from Author's calculation.

alize that different operators are using machines without quite following the prescribed procedures, or that oiling is done in a rather sporadic fashion, what is the point of using such a sophisticated computer system? Isn't it more appropriate to make sure that operators follow the procedures for machine operations and lubrication, and to educate them about identifying symptoms of potential failures before we install sophisticated diagnostic systems or computers?

The point of these examples is to remove organizational barriers, and quickly address issues where there are needs. Even if an idea is logically correct, installing systems without any consideration of the Jidoka concept is almost like developing a bureaucratic organization and leaving out customers. It reduces our ability to address causes in a timely and straightforward manner. We should realize that there are similar examples such as accounting procedures, production control and inventory management procedures, standard work procedures, etc.—all addressing the issues away from the real need.

We should repeatedly ask simple questions such as, "How much benefit do we get from managerial decisions that result in spending so much time collecting cost information?" We also may ask, "How much do we benefit from collecting

data on inventory counts at various stages of operations?" or, "How can we develop work standards which can be readily practiced and updated?"

Raising these questions requires imagination. Also, a broad understanding, rather than knowledge narrowly confined in one's own job responsibility, is in order. Then change requires the process of creative disruption, denying the current wasteful operation to create something better.

In this process, a challenging spirit and the willingness to experiment are essential. Furthermore, the process of challenge requires a supportive environment to let people try within reason. Most importantly, a value system of shared goals, challenging spirit, and higher expectations creates a culture to develop a critical mass of people who can practice these ideas. This culture often determines the outcome—the

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excellence in manufacturing.

If we do not have a culture in which people openly question current practices for improvement, we

may lack Jidoka mechanisms within the organization. As in the case of dormant suggestion programs, discouraging people with a challenging spirit will make the organization bureaucratic.

In a conference about three years ago, I addressed seven key elements of corporate culture which are conducive to JIT progress.<sup>2</sup> They are:

1. Challenging conventional beliefs
2. Bias toward experimentation
3. Tolerance for failure
4. Trust
5. Teamwork
6. Flexibility, and
7. Discipline.

How these elements are linked to the use of JIT techniques needs no long discussion. The key point is that *only* with a deep understanding of people and techniques in practicing JIT will there be true progress. Those leading the organization and facilitating the implementation of JIT should, I believe, convey these messages by whatever means available: education classes, company newsletters, posters, banners, improvement boards, awards, mingling with operators and support staff, involvement in actual improvement activities, self-study groups, etc. It is the strong conviction and shared understanding in aiming for the same target which makes the difference in the end.

### Summary

I have mainly described my viewpoint on the organizational as-

pects of JIT activities as one important foundation of our thinking. First is the importance of developing a shared target so that we can develop a sense of vision, commitment, and shared understanding. People-related problems more often prevent progress than a lack of technical understanding.

Second, the process of creative disruption is important not only for technical advancement but also for our own personal growth. If we do not address this point, the waste from under-utilizing people's potential capability can be tremendous.

Third, we examined the application of Jidoka in such a way that it will not only help to eliminate waste but also enhance people's capabilities. With quick action in response to needs, people's knowledge and wisdom will be better utilized—just as we can develop healthy nervous and muscle systems to increase our athletic skills through training.

Fourth, while applying the Jidoka concept will help motivate people and increase their capability, we need to flexibly accommodate changes in our own organization. Just as techniques, tools, and mechanisms apply differently in different situations, the organizational structure should also change to meet today's demand. Putting it simply, the organization should follow economic needs.

Finally, we shared the idea of a self-controlled, self-thinking, and self-motivated organization. As we pursue the quick response to customers' needs (internal or external),

break down organizational barriers, and streamline this process with various techniques, the organization's capabilities should be upgraded—more self-managed.

There are many barriers to the practice of these ideas. Even if we understand the principle in our brain, it is a different matter to actually exercise it. I believe, however, that there is not much choice if we are to move forward.

<sup>1</sup>Suzaki, Kiyoshi, *The New Manufacturing Challenge*, The Free Press, 1987, pp. 12-18.

<sup>2</sup>Suzaki, Kiyoshi, *Corporate Culture for JIT*, APICS Zero Inventory Philosophy and Practice Seminar, 1984.

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