

## Globalization of Japanese Companies and International Applicability of JIT

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After World War II, Japanese companies which had a spring-board to their growth in the Korean War rapidly further developed their competitiveness through the Tokyo Olympic and the Vietnam War. In the 1970s, under the lucky condition of yen depreciation in spite of a shift of the international currency system from the fixed exchange rate to the floating one, Japanese companies strengthened further their power to overcome "the oil crisis" and to increase exports. The increase has led to the trade friction between Japan and the U.S.

In the middle of the 1980s, Japanese companies encountered steep yen appreciation because of the big trade surplus in Japan, and the downfall of America into a debtor nation. However, they have sailed through these rocks by conducting a more complete rationalization. In the domestic area, they have pursued still more the efficiency-orientation and an expansion of the production capacity. At the same time, they have launched into the company-globalization for the main purpose of replacing their exports. Those activities seemed to have been successful.

In the early 1990s, "the bubble economy" of Japan collapsed. "Heisei slump", much more severe than the former "high-yen slump", arrived. The overproduction during the bubble economy has been exposed by shrinking domestic consumption. The force toward the increase of export in a domestic slump has been blocked by trade friction. In the car industry, for example, the current profit of Toyota in 1992 was \$10 billion. It is one half of the last peak in 1990. Other car makers are almost all in deficit.

We have to take notice of a special aspect of this slump. Namely, the past measures for overcoming slump, such as the efficiency-orientation which Japanese companies have utilized so far, can not be applied against this slump. This is because the major problems exist in Japanese management itself, such as life-long employment, seniority system, loyalty of employees and JIT production system etc., which brought up the international competitiveness of Japanese companies. It does not work now as it functioned before. Suspicion as to its validity has come. The modification of Japanese management is inevitable.

JIT production system is an invention of Japanese companies. The first founder of it is Toyota, although the original seed of JIT, TQC, came from U.S.A.. However, it could not have blossomed in U.S.A. because of factors such as individuality, the multiracial society, the existence of many independent small and medium-sized companies etc.. After World War II, it was planted in the climate of Japan. Here were homogeneous and collective workers as well as many small-sized firms with few managerial resources. The latter had made weapons parts during the war.

After World War II, Japanese companies which had scarce capital and equipment had to exclusively rely on collective workers of homogeneous value and many small-sized firms in order to catch up with western companies. The TQC is premised on a team work in a company and a participation of employees in management. Japanese companies have basically relied on human resources due to the post War special corporate environments and brought them into full play.

They started TQC as a style of pursuing production-efficiency by getting rid of various wastes, such as wastes in the process itself, inventory of parts, operations of workers and having rejects through "kaizen", workers' suggestions.

Parts assembled into products should reach the assembly line "Just In Time". This means that required parts in required quantities should be delivered to the assembly line at a required time. Various sections of manufacturing in the company have to be synchronized for that. Furthermore, the assembly line of a parent company has to be synchronized with small and medium-sized parts-makers called "shitauke", subcontractors, in order to procure a great deal of parts, 70% of the total in the case of the car industry.

Thus, Japanese manufacturing industries developed the "pull production system" of JIT which can be responsive to small, various and changeable market needs. It is, so to say, an embodiment of TQC and the counterpart of "push production system" of U.S. Ford. JIT, which formed its base in the 1960s, refined the system in the 1970s, and attained its summit in the 1980s enabled Japanese companies to produce high-quality manufacturing goods at a cheap price. It has played a great role which has driven "Made in Japan" into a world-prevailing goods.

The situation changes in the 1990s. The main pillars of JIT, industrious workers and many subcontractors, have changed their natures. This shift has been exacerbated in this "Heisei Slump" which has exposed the downside of the Japanese style of management and companies' globalization under the yen rise.

Under the steep yen appreciation, Japanese manufacturers have shifted production bases overseas. Producing finished goods and parts abroad, they sell them there and export them to third countries as well as to Japan. Procuring parts from overseas has become an important measure not only for alleviating trade frictions but for a cost reduction in Japanese manufacturers. Therefore, many “shitauke” parts-makers have lost jobs or have gone bankrupt.

Furthermore, due to the collapse of a part of life-long employment system under the slump, many “dankai” people, the generation around 42~55 years old which created JIT, have become suspicious about Japanese management. What meaning does their life as a “company’s man” who has deeply devoted themselves to their company with loyalty have for them? They have no confidence about recommending their children to enter the promotion race among salaried workers. The children also don’t respect their father’s life, which has sacrificed his private life. Thus, JIT has to be modified in accordance with this change of subcontracting jobs and values of generations.

On the other hand, JIT production system has been successfully introduced in foreign countries in Japanese companies’ globalization. Foreign companies have also actively introduced many factors of JIT by learning it from Japanese local factories.

The revision of JIT in domestic industry, on one hand, and the introduction of JIT overseas, on the other hand has thus encouraged the convergence of the different Japanese and American styles of production, which is expected to proceed in the 1990s.

Now, I will explain JIT problems by utilizing a questionnaire survey etc..

## 1. Merit of JIT

### a. team-work and “kaizen” movement

**Table-1 Implementation of JIT (number of company)**

	Transport E.	Electricity	Others
Yes	7	3	3
No	1		8

In table-1, 13 companies out of a total of 22, about 60%, are implementing JIT. JIT originally started, as mentioned above, in the car industry. After the oil-shock in 1973, it has been prevailed in all other manufacturing sectors. So, in this table, we can see the high

ratio of the implementation of JIT in the transport equipment industry.

**Table-2 Ten Basic Precepts of “Kaizen”**

1. Throw out fixed ideas on production methods.
2. Think of ways something can be done, rather than of reasons it cannot.
3. Do not make excuses ; first, ignore the current situation.
4. Do not demand perfection ; Do 50% immediately.
5. Correct mistakes straightway.
6. Do not spend money on improvements.
7. Without trouble, there is no wisdom.
8. To find the real cause, ask over and over again.
9. 10 men’s wisdom is more than 1 man’s knowledge.
10. Improvement is never-ending.

Table-2 is the display on the wall in a factory of a medium-sized parts-maker. It shows the basic precepts of “kaizen”. All employees start work by reciting them. Namely, JIT heavily relies on the “kaizen” movement among employees. They work in a teamwork style to improve the quality of products and the assembly process etc.. Through the “kaizen” movement, they can participate in their company’s management.

Team-work can be applied not only in the assembly line, but also in the whole company. All sections such as manufacturing, technical, design, sales etc. are organically combined for the purpose of pursuing the company’s goal of “high-quality as a No.1 priority” and “customer satisfaction”. So, one of the biggest merits of JIT is a formation of “the integration between specification and cooperation” in an organization. It can be applicable in every kind of organization to enforce its productivity. The utmost form of it is an orchestra.

**Table-3 Results by Implementation of JIT (number of company)**

	Transport E.				Electricity				Others			
	a	b	c	d	a	b	c	d	a	b	c	d
manufacturing lead time	2	2	2		1	2			1	2		
raw material inventory	3	2	1		1	2			1	1		1
quality of parts		3	3				2			1	2	
price of parts		3	3				1	1			3	
delivery of parts	1	4				3				3		
finished good inventory	1	4	4		1	1	1		1	1		1
process inventory	3	3			1	2			1	1		1
changeover time	2	1	3			1	2			1	3	
direct labor		2	3			1	2				3	
number of laborer	1	2	2				2				3	
indirect labor		2	3				2			1	1	1
space-efficiency	1	5			1	1	1			2	1	
rejection of product		4	2				2				3	
productivity of parts-maker		3	1	1		1	1			1	2	
total	14	41	24	1	5	14	16	1	4	14	21	4
%	17.5	51.3	30.0		13.9	38.9	44.3		9.3	32.6	48.8	9.3

a. very improved b. improved c. no change d. deteriorated e. very deteriorated

We can see the results of implementing JIT from table-3. As a whole, about 70% of “transport equipment” admits the improvement in manufacturing items. In the case of “electricity”, it’s 53%. Positive responses are seen in “manufacturing lead time”, “delivery of parts”, “rejection of product” and “various inventories”. Thus, we can see that JIT is effective in cost-cutting and in the improvement of quality in manufacturing goods.

#### b. long-term relationship between a parent company and “shitauke” parts-makers

Another big merit of JIT is the maintenance of a long-term relationship between a parent company and subcontracting parts-makers. The latter are chosen by a parent company from three criteria of QDC(quality, delivery and cost). In order to procure parts with quality, quantities and time just needed, the production lines of many parts-makers are synchronized with the parent assembly company as first, second and third “shitauke”, subcontractors. A parent company sometimes goes into “shitauke” to advise technically and financially in maintaining a long-term relationship. Thus, the quality of products of a parent assembly company can be assured by forming a vast pyramid of subcontracting system.

**Table-4 Partnership Between Related Companies (number of company)**

	Transport E.				Electricity				Others			
	a	b	c	d	a	b	c	d	a	b	c	d
quality of parts	3	2	3			3				3	3	
price of parts	1	3	4			2	1			2	4	
change of design		6	2			2	1			2	4	
assistance of finance		2	5			1	2			2	3	
order of parts	1	4	3			2	1			2	3	
delivery of parts	1	6	1			2	1			2	4	
instruction of R&D		4	3			2	1			1	5	
renewal of equipment		3	5			1	2			1	2	3
interchange of staff	1	3	4			3				2	1	3
total	7	33	30			18	9			17	29	6

a. very good b. good c. medium d. no good

Table-4 shows the partnership between a parent company and related parts-makers. From this table, we can see totally a good relationship between them. In the items of “quality, price and delivery of parts”, the satisfaction of the parent company in industries of “transport equipment” and “electricity” is at high level. “Others” include industries of food and precision machinery etc.. In those industries, implementation of JIT is on a small scale.

## 2. Demerit of JIT

Everything has two aspects of merit and demerit, shine and shadow.

The demerit of JIT is firstly the constant increase of labor intensity. Under an existence of enterprise union, a small buffer inventory and a tight staff allocation in a work shop etc. tend to make working conditions too high-tensioned. For example, about 20% of newcomers of Toyota leave there within one year, because of its hard working conditions. So, there has emerged an anxiety about the quality of products in Toyota, because assembly skills have become difficult to be transmitted from generation to generation of employees.

Secondly, a parent company forces subcontractors to be in difficult business conditions through requiring constant cost reduction and a very exact delivery-term of parts. Under the “Heisei slump”, in fact, Toyota required a 15% cost reduction from parts-makers in three years from 1994. In spite of satisfaction with parts-makers by parent companies as

seen above, they are tormented as shown in table-5.

**Table-5 Managerial Problems in Subcontractors** (%)

		past	now	future
1	severe request in reduction of parts-price	24.5	70.4	39.3
2	difficulty in transfer of cost-up on price	19.0	65.6	32.3
3	competition among rivalries in market	29.0	65.3	36.9
4	sever request for quality of parts	22.1	64.7	31.7
5	sever request for reduction of delivery-term	16.8	61.9	31.1
6	shortage of workers	17.2	52.6	24.8
7	difficulty in improvement by rationalization	8.8	42.3	29.9

Survey by Association of Machine Promotion March 1988

In this table, we can see the difficulties in subcontractors which have experienced pressure from their parents. They have been constantly required to give more price-cut, quality improvement, exact delivery-term from their parents in a severe competition among rivals. The cost-up by parent's requirement is difficult to be transferred on a price of their products or to be absorbed by a further rationalization.

This survey was done in 1988. Now in 1994, another new managerial problem has stricken subcontractors. Japan's export industries have increasingly gone overseas under pressure of trade friction and the yen appreciation. Subsidiaries abroad have to procure parts in local areas. Parents also have to procure parts from overseas. So, many subcontractors which supply 70%, for example in the auto industry, of their products to their parents have been confronted with a dramatic reduction of jobs. On the other hand, small numbers of mighty parts-makers which have strengthened their R&D want to get rid of the name "shitaue" and diversify customers and products. So, Japan's subcontracting system or "keiretsu", which has sustained JIT so far, is changing into a form similar to "partnership".

**Table-6 Problems in Implementation of JIT**  
(number of company)

	A	B	C
shortening of working-hours	5	2	
shortage of workers	4	2	
production with various models and a small lot	4	2	2
price of procured parts	2		
transportation company	2	1	
too much fluctuation of market needs	2	1	
trade friction	2	1	
delivery of parts	1		1
frequency of model changes		1	
increase of parts inventory			1
competition for price of products			1

A : Transport E. B : Electricity C : Others

**Table-7 Basic Points of Modification of JIT**  
(number of company)

	A	B
standardization of parts	4	
reduction of models	4	2
more automatization of production	2	2
improvement of working condition	2	1
rationalization of transportation of parts	2	
more buffer inventory of parts	1	
relationship between related companies	1	
change of staff allocation		1
reduction of model changes		1

A : Transport E. B : Others

Thirdly, JIT, which can precisely reflect various market needs makes up a production style with “various models and a small lot”. For example, a model, “Corolla”, of Toyota has 400 variations. It necessarily increases a constant cost. Thus, it reduces the ratio of an operation profit to only 0.9% of Toyota in 1994 vs. 1.7% of Ford in 1993. The profit for a sale of “Corolla” is only \$130. This demerit has definitely emerged in the “Heisei slump”. In table-6, many companies show this demerit of JIT.

According to Table-7, “standardization of parts” and “reduction of models” are main targets for alleviating the demerit of “various models and a small lot”. In fact, Toyota

intends to cut 20% of models and 30% of parts in 1993. It means a pursuit of the scale merit of a production like Ford System. "Standardization of parts" will be implemented also among different companies. The longer-term of model change will be another theme for car makers.

### 3. Introduction of JIT in Production Abroad

**Table-8 Experience of Introduction of JIT in Overseas Production number of company**

	Transport E.	Electricity	Others
Yes	6	1	0
No	3	2	5

**Table-9 Problems in Adaptaion of JIT in Overseas Production (number of company)**

	Transport E.	Electricity
education to local parts-makers	4	1
procurement of parts	3	1
education to local workers	2	
education to local managers	2	
expatriated staff	1	
social infrustructure	1	1
movement of local residents	1	
regulation of local government	1	

According to table-8, six companies out of nine in the auto industry have introduced JIT in their foreign productions. They show parts-related problems in Table-9. They also make an effort to educate local managers and workers for the introduction of JIT.

**Table-10 Applying Japanese Management in Overseas production  
(weighted average)**

	A	B	C	D	average
USA					
production technology	4.2	3.7	1.5	2.0	2.9
parts procurement	3.3	3.7	1.0	2.3	2.6
salary system	1.5	1.0	1.0	2.3	1.5
job classification	2.2	1.7	1.0	3.0	2.0
job rotation	3.0	1.7	1.5	3.0	2.3
small-group activities	3.8	2.0	1.5	3.7	2.8
local authority	3.2	2.3	1.0	3.7	2.6
average	3.0	2.3	1.2	2.9	2.4
ASIA					
production technology	4.3	3.3	4.0	3.0	3.7
parts procurement	3.8	3.0	3.0	3.0	3.2
salary system	1.7	1.3	2.0	4.3	2.3
job classification	2.2	1.7	2.0	4.0	2.5
job rotation	2.8	1.7	1.5	3.7	2.4
small-group activities	3.2	2.0	1.5	4.0	2.7
local authority	3.0	2.7	2.5	4.0	3.1
average	3.0	2.2	2.4	3.7	2.8
Europe					
production technology	3.8	3.0	—	3.0	3.3
parts procurement	2.5	3.3	—	3.0	2.9
salary system	1.8	1.0	—	2.3	1.7
job classification	1.8	1.7	—	3.3	2.3
job rotation	2.3	1.7	—	3.7	2.6
small-group activities	3.0	2.0	—	3.7	2.9
local authority	2.5	2.3	—	3.0	2.6
average	2.5	2.1	—	3.1	2.6
total average	2.9	2.2	1.8	3.2	2.6

A : Transport E. B : Electricity C : Steel D : Others

1. 100%local 2. 75%local 3. 50—50% 4. 75%Japanese 5. 100%Japanese

Table-10 indicates a weighted average from 100% local to 100% Japanese management, a larger concept than JIT in this case, in productions abroad. The factor to which Japanese style is most highly applied is “production technology”. Especially, in the auto industry, the average is a high level of 4.2 in America, 4.3 in Asia, 3.8 in Europe. Namely, about 80% of their foreign productions have been managed in Japanese style. In the electricity industry, the average is slightly smaller than that of the auto industry. Companies in those

industries have tried to plant their production technology in foreign factories which they have newly built. In the steel industry, the average in America where companies manage a joint venture is a low level of 1.5. Namely, 85% of production there is local style. However, in Asia where companies in the steel industry set up new factories, the average is 4.0 of Japanese style.

The other factors of Japanese style in the auto industry are 3.8 of “small group activities”, 3.3 of “procurement of parts” and 3.2 of “authority in subsidiaries” in America. In Asia, they are 3.8 of “procurement of parts” and 3.2 of “small group activities”.

In the electricity industry, we can not recognize factors colored by Japanese style except for “technology of production” in all areas and 3.3 of “procurement of parts” in Europe. Five companies in other industries introduce Japanese style relatively well particularly in Asia, 4.3 of “wage system”, 4.0 of “job classification”, 4.0 of “small group activities” and 4.0 of “authority of subsidiaries”.

Thus, from 2.6 of total average in Table-10, we can make up an overall image about an application of Japanese management in productions abroad as 60% of local style and 40% of Japanese one.

#### 4. Social Regulation and Corporate Image

The Japanese government has recently begun to regulate JIT to protect the social benefit. The Ministry of Labor has condemned JIT for causing too hard working conditions, not only for assembly workers but for truck drivers who convey parts in “kanban system”. The Ministry of International Trade and Industry and the Environment Agency have required companies to modify JIT for alleviating the traffic-jams and air-pollution by so many trucks. In 1992, the Economic Council of the Government proposed to have more leisure time for the life of Japanese people. It aimed for 1800 yearly working-hours against JIT.

Thus, people have gradually formed a bad image of JIT from a view point of social benefits, even though it is sure to have great merit for the company's profit. The representative of JIT is Toyota. So, people tend to have a bad image about Toyota in saying that it has no corporate moral only to pursue profit in “efficiency as a No.1 priority”. This situation forces Toyota to modify its bad image of JIT for selling its product well and accepting workers of ability. In 1992, Toyota renewed the old corporate identity only with efficiency-orientation into displaying “open and fair corporate activities”, “good products

for earth environment", "exploration of attractive products through active R&D", "facilitation of creativity of individuals" and "dedication to local economy overseas" etc..

## 5. Feedback from overseas

In 1991, Toyota built the forth factory at Tawara in Aichi prefecture. The factory is an experimental one for Toyota to modify JIT. It has a high level of 14%, two times that of before, of automative production system and facilities for more easily assembling parts. The idea of "zero inventory" is modified. One long assembly line is abolished to have parallel lines with more parts-inventories. The production-tact time is modified to 3~6 minutes per one unit from 1 minute as before in order to reduce hard work. The work from 21 o'clock to dawn by a second working team is also abolished. These easier working conditions were also introduced in the new factory of Miyata in Kyushu in 1992. We can say that this new experimentation is based on feedback from factories abroad where Toyota has tried to introduce JIT in accordance with local conditions.

Automation, however, is not always almighty. It deprives workers of the chance of a participation in management by "kaizen". Workers feel alienated among robots. Moreover, it necessarily raises a constant cost unless the number of workers is not reduced. The cross point of loss and profit has risen to around 90% in the case of the auto industry. This means that a 10% reduction in production drives car makers into deficit. The downfall into deficit of car makers has become a reality under the 20% reduction of operation ratio in this slump.

The system of parts-procurement is also about to be modified by learning from foreign countries, especially in America. "Milkpail" and "electronics kanban" system can be utilized. The mixed conveyance of parts among different companies is also introduced.

Now, American car makers intend to introduce Japanese style of production, JIT, on one hand. On the other hand, Japanese car makers have to modify JIT into a part of American style. Thus, we can expect the difference of production style and a competitiveness between Japanese and American car makers will be converged till the late 1990s.

Tables were developed from a questionnaire survey which I investigated as a member of a group research team at Chukyo University in 1992. Questions were sent to Japanese big companies of "Fortune 400". Twenty-five companies responded.

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