Flexible Manufacturing Systems Deployment and The Overseas Transfer of Japanese Management (A Study of Mazak Machine Tools Plant in the U.S.)

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I Japanese Manufacturing Abroad

Since 1945 Japanese companies have shifted their strategic focus at least four times: from low-labor costs in the 1950s, to scale-based economies in the 1960s and to limiting product line variety in the 1970s (Abegglen, Stalk 1985). During the 1980s the appreciation of the yen coupled with threats of protectionism forced Japanese business to shift production abroad. At the same time computer integrated manufacturing technologies revolutionized the economics of production, enabling companies to achieve optimum cost points at a higher volume and with greater variety of products and with response time being eight times faster than in traditional systems. With the use of flexible manufacturing, time has become the strategic weapon and the next source of competitive advantage (Stalk 1988).

It is estimated that today more than half of the world's FM (flexible manufacturing) systems are operated by Japanese companies. Comparative studies show that the Japanese require four

times less time to develop, install and operate an FM system than American companies do. (Jaikumar 1986) Thus, the Japanese are developing superior capabilities in an area of critical importance to the future of manufacturing competitiveness.

Having mastered the use of FMS technology inside Japan, in the past few years Japanese companies have been installing these advanced systems in their overseas plants. This means that foreign managers and employees have become the actual operators and users of advanced manufacturing technology within a system of management that has been transferred from Japan. Japanese owned plants recently opened in the U.S. and Europe are now among the most modern and competitive in the world (Krafcik 1988).

More than half of this direct investment by Japanese companies has gone to North America and the EEC (Jetro 1983). By 1987 Japanese companies had 625 majority owned production or assembly plants in the U.S. If jobs associated with 1988 investments are counted - the number of Americans employed in these Japanese operations is well in excess of 155,000 with another 44,000 jobs created or maintained through minority investments (JEI,1988). The number of Japanese manufacturing operations in the EEC (which totalled 242 in 1986) and the jobs thus created have been estimated to be about half of the U.S. figure (Duser, Thurley 1988). According to MITI, by the end of fiscal 1984, 900,000 jobs had been created by Japanese companies worldwide — 700,000 of them in the manufacturing sector (MITI 1988). It can be safely estimated that by 1989 the total number of non-Japanese working in various Japanese firms was well in excess of one million worldwide.

With some notable exceptions, (Business Week, 14 July 1986, Time, 23 May) Japanese transplant firms enjoy good relations with their workforces and the productivity and quality achieved by European and American workers in these Japanese-owned plants are high. (Rehdner R. 1988, Krafcik, 1988, Business Week,

14 July 1986, Wall Street Journal, 8 June 1987). This success with "transplanting" Japanese management practices to the West has led some Japanese scholars to speculate that Japanese management "with its humanistic holistic orientation, will probably hold within it the possibility of playing a leading role in the international community" and will become Japan's "gift to the world" for the 21st century (Hayashi, 1987).

Before that happens, however, there is mounting evidence that Japanese management faces considerable difficulties and problems when it interfaces with Western white-collar employees especially in the area of authority sharing with locally hired executives.

A recently published survey by Japan's Ministry of International Trade and Industry revealed that Japanese companies abroad were far more likely to staff management positions abroad with personnel dispatched from the home office than were their foreign counterparts. Of the top officials at Japanese owned subsidiaries abroad, 45.4% had been transferred from the home office against 17.3% for foreign owned subsidiaries in Japan. The staffing ratio for section chiefs and department heads was 17.4% for Japanese firms and 1.6% for foreign firms. Similarly, conservative practices were noted in the borrowing patterns of Japanese firms abroad, which, according to MITI, borrowed only 26.5% of their long-term funds from indigenous banks (the comparable level for foreign firms in Japan was 69.3%). These results are significant, especially for the U.S.since they appear to strengthen the claim of those who argue that Japanese direct investment brings fewer benefits dollar for dollar—at least initially—than does investment from other countries.

Those articles that have appeared in the American press document the frustrations and lack of real influence of U.S.managers working for Japanese corporations. One author writes that while "Japanese companies complain privately that they are getting inferior managers...ambitious American simply leave Japanese companies when their career paths are blocked" (Business

Month, 1988). The articles document the problems that both sides have in working with each other: Americans are often seen by the Japanese as impatient, disloyal and lacking a sense of teamwork. On the other hand American managers complain that they are excluded from key information and decisions making. (Los Angeles Times, July 10,1988).

Studies performed in Europe show that the difficulties of Japanese companies in managing professional and managerial staff are not confined to the United States. H.J.Heise concludes his study of Japanese companies in West Germany: "We have identified the recruitment of managerial staff, personnel management and business administration of Japanese subsidiaries in West Germany as being very problematic." According to White and Trevor who researched a Japanese trading company and two Japanese banks operating in the city of London, "the response of white-collar workers to Japanese-style management appears less positive than that of blue-collar plant workers." (Shibagaki, et al 1989). In his book based on experience while working for SONY in France, Dominique Turcq writes: "I often heard criticism in the sense that the Japanese raise objections, that communication with them is bad, that they keep exclusive information to themselves, do not delegate responsibilities and constitute a closed group" (Turcq,1985).

Hideyuki Yoshihara of Kobe University states that graduates from top Western universities avoid working for Japanese corporations. Consequently, there is very little top-class talent in foreign subsidiaries. He concludes his study of Japanese management overseas by saying that while the factory and production systems are the "bright side" of Japanese multinationalization, "the dark aspect is the office." The Japanese management system is not necessarily welcomed by office workers in banking, trading and other service companies. Moreover, middle and top managers and engineers in Japanese overseas manufacturing companies also have many complaints against Japanese-style management. "The high frustration level tends to affect their

performance negatively...careless transfer of the Japanese management system abroad must be avoided. Perhaps Japanese multinationals are facing the difficult problem of reviewing their concept of multinationalization." (Yoshihara,1989).

II Mazak Machine Tool Company

The original plan of researching two Mazak plants one in the U.S. and one in Europe had to be modified and finally only the Florence, Kentucky plant located in the U.S. participated in the study.

Yamazaki is a privately owned Japanese manufacturer of machine tools. As such it is regarded as a world leader in the building of numerically controlled advanced machine tools. Both in size, sales and technology Yamazaki is ranked at the top of the world's machine tool manufacturers.

In 1979 Yamazaki opened a new manufacturing plant in Florence, Kentucky. Over the years the facility was gradually expanded so that floor space and ancillary facilities had been increased 22 times from 1,570m^2 to 34,200m^2, while annual sales skyrocketed 150 times. Currently the plant is undergoing further expansion and modernization with the installation of the latest FM systems to replace the FM system previously operating.

Additionally, Yamazaki (known as Mazak outside Japan) established a plant in Worcester, England in June 1987 as well as marketing centers in Belgium and W.Germany.

III Research Questions and Procedures

The study set out to find answers to the following research questions.

1. What is the impact of FMS on the management process and work content as perceived by a) employees b) managers? The formulation of this question was largely inspired by S.Zuboff's hypothesis. Successful implementation of advanced manufactur-

ing technology such as computer integrated flexible manufacturing requires a strategy of technology deployment that goes beyond pure automation. Full expoitation of advanced manufacturing technology requires a "workforce information strategy" (Zuboff 1988) which means giving up full managerial control over the organization's knowledge base and the creation of a learning (rather than a deskilling) environment in which managers and employees become "partners in learning."

2. What specific policy changes were perceived by U.S. managers and employees to be most effective in enhancing the effectiveness of the U.S.−Japanese management team in the plant? What kind of "vision" of cross-cultural management emerged as a result of the postulates made by American employed by Mazak.

Data gathering began with an on-site visit at the Florence, Kentucky plant and extensive interviews with U.S. and Japanese managers and employees. This visit was made in the Fall of 1989 and as a result 2 questionnaire research instruments were developed: one for management and one for employees involved in direct manufacturing. The questionnaire was submitted for review and comments to Mazak management and after some discussion was accepted. Its actual implementation however was delayed by the retirement of the CEO of the plant and the modernization work. Thus, full responses to the questionnaires were not obtained until May 1990.

The managerial questionnaire was distributed to all of 39 American managers and supervisors at the plant. 19 managers responded giving a response rate of 55%. At first Japanese managers were to be included in the survey but they ultimately declined to take part.

Of the 269 employees in direct manufacturing at the plant − a 7% sample was selected yielding 17 valid responses.

The managerial questionnaire consisted of 42 closed questions with additional sections for qualitative comments. The employee questionnaire was shorter by 8 questions. In both questionnaires

5 point Likert type response scales were used.

IV Results

a) Impact on Flexible Manufacturing on Management and Employees.

There was a high degree of agreement between managers and employees that FMS significantly alters the work environment as compared with traditional manufacturing: 65% of employees and 73% of managers either agreed or agreed strongly with this statement.

Not everyone agreed, however, as to the precise nature of the impact of FMS, 55% of mangers and 53% of surveyed employees believe that FMS is more demanding and difficult to operate. However, about 25% of the respondents in each group disagree with this, while about 15% believed that there was no difference. Probing the issue further revealed that more than half of the managers and about the same proportion of employees believed FMS requires higher levels of skill from the workforce. More importantly perhaps, 89% of employees and 70% of managers felt that FMS requires more continuous training at all levels.

The hypothesis that more information sharing occurs under FMS was only partly confirmed by the survey results. 55% of surveyed managers agreed with this (40% did not), but only 29% of employees did. 70% of managers and 41.2% of employees declared that with less support staff the workforce does in fact have greater responsibilities. Sometimes these responsibilities take the form of more cross−training and rotation of assignments (55% of managers and 29% of employees felt this was true).

FMS however does not immediately reduce paperwork. Only 25% of managers and 17.6% of employees felt this was true. Nor is there an "automatic" change of supervisory style brought by FMS. Only a minority of managers (30%) and of employees (35%) felt that management under FMS must act more as leaders

than supervisors. Nevertheless, FMS does require more learning, a point that was made by 70% of managers and 59% of employees. It was stressed in individual responses that FMS required greater pre-planning and coordination skills that cut across departments. In turn this generates interdependence and enhances communication.

Thus, Zuboff's hypothesis is only partly borne out by the survey results. Since the FMS systems at Mazak were still under implementation, it could be argued that their full impact had not in fact been realized at the time of the survey.

b) Ways in which American Managers Could Improve Their Interactions with Japanese Expatriates

A section of the managers questionnaire was devoted to the issue of improving cross-cultural cooperation between U.S. and Japanese managers. What should American managers do? 40% of responding managers felt that Americans should be required to reach a minimum standard of proficiency in the Japanese language (70% disagreed). However, the majority (60%) of mangers felt that all American managers should complete formal mandatory training in Japanese culture, society and ways of doing business and a full 90% stated that if given such an opportunity they would participate in a training seminar of this kind.

The majority of surveyed managers (70%) wanted to see their decision making power increased. Only 25% would entertain an offer to work at company headquarters in Japan for a period of 3−5 years. 58% wanted to have Americans sit on the board of directors of the company. Interest in learning more about Japan was clearly evident as was the desire to increase the influence of Americans in management and on the company board.

c) Suggestions for Japanese Expatriate Managers

In both the manager's and employees versions of the questionnaire a section was devoted to soliciting ideas and views regarding the utilization and training of Japanese expatriate managers working in the United States.

The first issue was the time span for which Japanese expatriates should be sent to the U.S. Opinions among employee respondents were somewhat split, with the greater number of respondents opting for 3-5 years (41.2%) or 5-10 years (23.5%). Managerial level respondents also felt that Japanese expatriates should come for at least 3 years (40%) and as many as 30% felt they should come for 5 years or more. It is worth noting, that if this recommendation were to be implemented, it would in effect mean extending the usual stay of expatriate managers in the U.S. (which is around 3 years and its lengthening is constrained by the Japanese career patterns and education needs of families).

As regard, the best age and experience at which a Japanese expatriate should be sent over, the consensus among both employees and managers was that an expatriate should be 30-40 years old and should preferably have some prior overseas experience.

In terms of ideas for improving the training of Japanese managers the following views were expressed by the managerial level respondents. (Table 1)

TABLE 1

U.S.Managers Preferences for Improvements in Japanese managers Skills Training

(%)

Priorities of Japanese Managers Training	Should be stressed much more	More Emphasis	As Before	No Opinion	Not Significant	Ranking(combined 1&2rep.)	
English Language Speaking/ Understanding skills	15	60	25	–	–	75	(1)
English Language Written skills	–	50	45	–	5%	–	4
American business ethics	15	25	25	15	20	–	5
American business laws and regulatory environment	25	50	20	5	0	75	(1)
General knowledge of American business practice	20	45	10	10	15	65	(2)
American history/cultural traditions	15.8	10.5	26.3	21	26.3	–	6
Interpersonal skills of dealing with American colleagues	10	45	25	20	–	55	(3)
Understanding and appreciating the U.S. employee	20	45	10	15	10	65	(2)
Individual decision making skills with responsibility	10	45	35	10	–	55	(3)
Learning frank open communication including the acknowledgement of errors and constructive confrontation when appropriate	25	40	20	10	5	65	(2)

Table 2 on the other hand represents the views of the employees regarding ways in which Japanese managerial training should be improved.

TABLE 2

Employees' Preferences for Improvements in Japanese Managers Skills Training

%

Priorities of Japanese managers Training	Should be stressed much more	More Emphasis	As Before	No Opinion	Not Significact	Ranking (combined 1&2rep.)	
English Language Speaking/ understanding skills	17.6	47.1	23.5	5.9	5.9	74	(9)
English Language Written skills	17.6	52.9	17.6	5.9	5.9	69	2
American business ethics	35.3	29.4	23.5	5.9	5.9	65	(3)
American business laws and regulatory environment	41.2	35.3	5.9	11.8	5.9	76	(2)
General knowledge of American business practice	23.5	41.2	35.3	–	–	64	(4)
American history/cultural traditions	17.6	23.5	47.1	5.9	5.9	6	
Interpersonal skills of dealing with American colleagues	5.9	47.1	41.2	5.9	–	5	
Understanding and appreciating the U.S. employee	23.4	70.6	5.9	–	–	94	(1)
Individual decision making skills with responsibility	11.8	35.3	52.9	–	–	7	
Learning frank open communication including the acknowledgement of errors and constructive confrontation when appropriate	29.4	35.3	11.8	–	–	65	(3)

The priorities of the traning needs expressed by the two groups overlap to a significant degree although some interesting differences remain.

For employees the most salient issue is "understanding and appreciating the American employee" followed by "understanding American business laws" and the regulatory environment. For managers the latter issue alongside "English Language speaking/understanding skills" is of paramount importance. U.S. managers believe that "General knowledge of American business practice" and "understanding the American employee" are equally important training needs, followed by individual decision making skills and interpersonal skills with open communications, acknowledgement of errors and constructive confronta-

tion when appropriate.

For employees written English language skills are of importance, but generally their views are not very different from that of managers. The message that emerges is that in a number of areas Japanese managers would do well to increase their training well beyond what they currently appear to have.

d) Improved Cooperation Between U.S. and Japanese Managers

In their interview responses a number of American managers expressed the view that there was considerable room for improvement in the area of cooperation between them and their Japanese counterparts. At the same time it was realized that some ideas would take a longer time to implement than others, thus the next series of questions were framed in terms of not only the appropriateness, but also the time perspective in which new ideas could be implemented. The responses of the two surveyed groups are presented in Tables 3 and 4.

The ideas presented to the respondents were controversial and different views emerged as to the most appropriate time frame for implementation.

Of the projects that could be launched at once the idea of partnerships between Americans and Japanese working together on projects to facilitate mutual learning received overwhelming support (75% of respondents). The idea that American successors to the Japanese should be actively groomed (with the Japanese managers assuming mentor roles) was also popular: 50% of U.S. managers wanted it implemented at once while 35% saw it as viable within a 5 year time horizon. More social events between local and Japanese staff were almost as popular with 41% of managers proposing immediate implementation and another 16% a more gradual introduction over 5 years. (Required formal team-building workshops were somewhat less popular 35% and 25% levels of support with 30% stating that the idea requires further study). More controversial was the idea that English should be made the official language in all written and oral communication: 40% wanted this to be effective at

once, 10% within 5 years and another 10% over 5−10 years. 25% of respondents thought the idea was inappropriate.

TABLE 3

Improving U.S.-Japanese management Cooperation/Managers' Views

Proposals	To be implemented at once	Within 5 Years	Within 5-10 Years	Requires Further Study	Not Appropriate	No Opinion
More social events should be sponsored between local/ Japanese staff	47.3	15.8	5.3	15.8	15.8	–
Formal teambuilding workshop should be required	35.0	25.0	–	30.0	10.0	–
All managers including expatriates should be under the same pay/evaluation/promotion system	20.0	15.0	5.0	40.0	25.0	–
Career planning/tracking system for all managers and professionals should be introduced on a company wide basis	35.0	40.0	5.0	15.0	5.0	–
An international corporate culture model should be developed	–	26.3	5.2	47.3	21.0	–
English should be made the official language in all written and oral commuinication	40.0	10.0	10.0	15.0	25.0	–
An improved PR program for the company should be developed	30.0	50.0	5.0	5.0	10.0	–
Opportunities should be made for non-Japanese to work in Japanese headquarters	20.0	20.0	10.0	40.0	20.0	–
Overseas plants should become independent from headquarters	5.0	10.0	–	25.0	60.0	–
American successors to Japanese managers should be actively groomed with Japanese managers assuming a mentor role	50.0	35.0	5.0	5.0	–	–
Partnerships between American and Japanese working together on a project should be encouraged to facilitate mutual learning	75.0	15.0	–	5.0	5.0	–
Broader hiring of bilingual professionals	10.0	10.0	10.0	40.0	30.0	–

The idea that all managers including expatriates should come under the same pay/evaluation/promotion system was not as widely popular as might have been expected: 40% stated that this would require further study, while 25% disqualified the idea. Only 20% wished immediate implementation. Instead a career planning system for all managers and professionals to be gradually phased in over a number of years was the more popular idea.

When asked about opportunities for non-Japanese to work in Japanese company headquarters, most managers responded that this should be studied further; 40%-50%, however, felt that this concept could be implemented either at once (20%) or over a number of years (30%). Curiously the idea of broader hiring of bilingual professionals was not particularly popular: with 30% rejecting the idea and 40% declaring that it would require further study — only 10% thought that it was worth pursuing at once. Even more controversial was making overseas plants more independent from headquarters — a full 60% of respondents rejected this idea.

The views of American employees on those issues are summarized in Table 4. Very broadly speaking they are similar to the managerial viewpoint although some interesting differences are apparent.

Once again the idea of working partnership between American and Japanese is the most popular — 76% want it implemented at once. Using English as the official language is supported by 65% of employers (as opposed to 40% of managers) followed by an equalization of pay/employment systems between American and Japanese managers. Social events and formal teambuilding workshops are somewhat less popular among employees than among managers. Employees are far less concerned about growing American successors to Japanese managers and much more often have "no opinion" about proposals related to changes in management. They were also far less decisive about dismissing a program as inappropriate.

The results of the survey are valuable as they could be used as a basis for a specific plan of improving the cross-cultural functioning of U.S.—Japanese management teams.

TABLE 4

Improving U.S.-Japanese Management Cooperation/Employee Views

Proposals	To be implemented at once	Within 5 Years	Within 5-10 Years	Requires Further Study	Not Appropriate	No Opinion
More social events should be sponsored between local/Japanese staff	41.2	17.6	4.0	17.6	—	23.5
Formal teambuilding workshop should be required	29.9	35.3	—	35.3	—	—
All managers including expatriates should be under the same pay/evaluation/promotion system	52.9	5.9	—	23.5	5.9	11.8
Career planning/tracking system for all managers and professionals should be introduced on a company wide basis	41.2	17.6	—	23.5	—	17.6
An international corporate culture model should be developed	5.9	5.9	—	41.2	11.8	35.3
English should be made the official language in all written and oral commuinication	64.7	5.9	5.9	23.5	—	—
An improved PR program for the company should be developed	41.2	11.8	—	3.9	—	41.2
Opportunities should be made for non-Japanese to work in Japanese headquarters	23.5	23.5	11.8	17.6	5.9	17.6
Overseas plants should become independent from headquarters	5.9	—	5.9	52.9	17.6	17.6
American successors to Japanese managers should be actively groomed with Japanese managers assuming a mentor role	11.8	23.5	11.8	11.8	11.8	29.4
Partnerships between American and Japanese working together on a project should be encouraged to facilitate mutual learning	76.5	5.9	—	5.9	5.9	5.9
Broader hiring of bilingual professionals	17.6	17.6	5.9	23.5	5.9	29.4

Conclusion

This paper explored the management implications of introducing a flexible manufacturing system in a Japanese owned machine tool plant located in the United States. The concurrent transfer of Japanese management practice was also studied.
The survey of both mangers and employees of MAZAK found that the impact of FMS (flexible manufacturing systems) deployment may not be immediately felt in a clear cut way as suggested by such authors as Zuboff. Rather the adjustment to operating an FMS is an extended learning process whose full benefits are perceptible only after considerable experience with the system. Results of the study indicated also the most desireable steps that, in the opinion of US managers and employees, should be taken to improve the effectiveness of cooperatrion with Japanese expatriate managers. These steps include in the first instance : improved training for Japanese expatriate executives in understanding American workers and the US business environment and structured partnrerships between American and Japanese personnel with mentor relationships and career planning. More radical ideas such as a uniform pay / promotion systems, the hiring of bilingual professionals or using English as the official language were viewed much more skeptically and deemed to require further study and refinement before implementation could be contemplated. These results suggest that the improvement of cross-cultural managemnt and cooperation should constitute an incremental process in which training activities, team building and better mutual understanding are of more immediate priority than changes in personnel practice and policy.

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