

THE PROVISION OF MANUALS AND JAPANESE PRIVATE TECHNOLOGY TRANSFER

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I. INTRODUCTION

A SURVEY conducted in 1984, concerning industrial technology transfer on a commercial basis by Japanese companies to developing Asian countries¹ reveals that Japanese companies provide the partner company with which they are in technological collaboration with insufficient production manuals. The production manuals here are those relating to production technology, i.e., operation manuals, procedures, process control manuals, and so on. Out of sixty-seven companies surveyed, only eighteen, about 27 per cent of the total, provided a complete set of manuals and no less than twenty-four companies, about 36 per cent, provided their partners with no manuals. The majority of the recipients expressed dissatisfaction over this situation.²

This is not a recent phenomena, however. Complaints in relation to manuals have been voiced even among Japanese staff overseas in the 1970s.³ We are thereby able to assume that this problem has not solved, though improved to some extent, for a long time. It could be said that the manuals problem is a particular feature of Japanese technology transfer.

This problem has drawn little attention from Japanese students of technology transfer. So far as my knowledge goes a few studies including [6] and [9] made reference to the need of the manuals. But they were concerned with the manuals on managerial techniques where transplantation into another country of the Japanese management system seemed to be causing some friction.

This paper intends to consider the reasons behind the Japanese attitudes toward

¹ The Institute of Developing Economies organized a large-scale fact-finding study, headed by Shōji Itō, on technology collaborations between firms in Japan and those in Asian countries: the Republic of Korea, Taiwan, Hong Kong, the Philippines, Thailand, Malaysia, Singapore, and India. Topics surveyed cover a variety of aspects of technology collaboration, industry, size, timing and length of collaboration, extent of capital participation, motives and objectives of collaboration, rate and volume of technology fees, and other macro- and micro-economic results. The results are published in [3].

² To quote some typical comments from recipients: "no manual was provided," "only the basic design was given," "design showed only the core," "manuals provided were incomplete in the sense that we cannot understand what is written," "full of Japanese English," "Japanese experts neglect and scorn manuals provided by their own head office."

³ Research conducted by the Japan Committee for Economic Development in 1977 records opinions raised by Japanese staff stationed abroad in relation to the provision of manuals. See [4].

the provision of manuals in the carrying out of technology transfer. Our understanding is that neither neglect of the importance of the problem nor mere idleness on the part of Japanese companies are the reason why effective action has not been taken to ease the tension caused. There were, and are, fundamental reasons deeply rooted in the systems of management and skill formation in Japanese companies within which Japanese industrial technology has been developed and utilized.

II. ON-THE-JOB-TRAINING AND ITS PROBLEMS IN TECHNOLOGICAL COLLABORATION

It seems undoubtedly clear that when Japanese companies began foreign technology transfer in the early 1960s, they did not have adequate, well-prepared manuals for either managerial or production purposes. As Reiji Setō [7] pointed out, unlike American companies who had accumulated a wealth of experience through investment in Latin America, Japanese companies drifted into production abroad, mostly in Asian countries, with no standard guidelines, and consequently on an almost trial-and-error basis. What they relied on was naturally the method they had long accustomed to in their home country, the on-the-job-training (OJT) method, particularly on a man-to-man basis. This section deals with the on-the-job-training in Japanese companies and describes its characteristics and limitations.

A. *Basic Design of OJT*

In technical education and training, Japanese companies place special emphasis on OJT. Instead of recruiting qualified and experienced manpower from the open market as American and European companies do, Japanese companies tend to train unexperienced young manpower, and, in general, subsequently promote them to higher posts as they acquire technical, often managerial, skills. This way of promotion is intentionally adopted as it is expected to provide a great incentive for employees to acquire skills.

There are three basic requirements for OJT: first, time—it takes a long time to produce skillful workers; second, a number of training staff; and third, close communication between trainer and trainee. It may need some words in regard to time. As will be discussed in Section III, Japanese companies train a worker to be multi-skilled and a rotation system is introduced for this purpose. A worker is shifted from one job to another as she or he masters each skill in each job. Rotation is usually once every two or three years making this system of OJT very time-consuming.

B. *Manuals Used in OJT*

The OJT method does not necessarily preclude the usefulness of manuals as an instrument for technical training, but OJT does not put so much emphasis on the role of manuals in teaching skills. Manuals may give a description of a machine, part of a machine, production processes, or what to do or not do, and do, therefore, assist those working with the machine. However, written explana-

tions always have some limitations. The user of the manuals can not always do what the author of the manuals expects.

The OJT method has distinct merits in this regard. The trainer can show a delicate action in a simple motion which, if written, can be described only in very complicated sentences. The trainer can also give the trainees better idea of the most appropriate *degree* to which something should be done, for instance, the tightness of a screw, or the interval distance to be set between two things, in a specific work process. These skills are very difficult to master completely or explain in a written sentence. The OJT can avoid these difficulties satisfactorily with the help of oral communication between the trainer and trainee. In the OJT method, therefore, the trainee is expected to use the manuals mainly as a complementary textbook.⁴

C. *Application of OJT to Technology Transfer Abroad*

The three basic requirements—time, a number of training staff, and close communication between trainer and trainee—cannot, however, always be accepted and/or fulfilled abroad.

First, the length of time required in training engineers and workers has in itself disadvantages. It does not support the expected goal of achieving faster transfer of technology which both the recipient and its government are particularly concerned about. It means for the local engineers undergoing training that their promotion will be delayed for a considerable amount of time. Thus this has invited a variety of criticism.

Looking at this from another angle, it inevitably creates a serious burden for either the technology supplier or its local partner company in respect of personnel expenditure. The longer the Japanese experts stay, the larger the cost becomes for the company in terms of personnel expenditure. This cost can be cut to some extent if the local engineers can take the place of their Japanese counterparts, something the recipient side has insisted upon for a long time pointing out that OJT is contrary to the economic rationale of business management.

Second, the need for a number of training staff is a difficult requirement to fulfill. Well qualified engineers for this purpose were not available in developing countries, particularly in the initial stages of Japanese technology transfer. To meet this requirement, Japanese company send its engineering staff to the partner company to train workers there. These training staff are replaced by other Japanese engineers at the end of each one's assignment, according to the company's personnel policy.

Even in the case where local engineers took the place of Japanese experts in training new workers, Japanese experts are sent on special assignments or on a regular basis to introduce revised technologies, to cope with changes in models, and so on. Since the progress of technology in Japanese company is very fast,

⁴ It is sometimes said that a Western expert does not teach hand in hand as the Japanese did when the local staff was in trouble. He simply gave instructions saying that the manuals provided would answer any questions and that the local staff should read the manuals again and again. This may be an extreme case but it is illustrative of the subtle but definite differences in the Western and Japanese types of technology transfer.

these temporal and regular visits by Japanese experts to the partner company are very important to maintain and increase the competitiveness of the products concerned.

This presence of Japanese experts on the scene in the recipient company for such a long time has created friction and confrontation and doubts as to whether the Japanese really intend to transfer technology to developing countries.⁵

Third, the need for close communication between the trainer and trainee constitutes one of the most sensitive problems in Japanese technology transfer abroad through OJT. The core of the problem is that of language, English in most cases, particularly on the part of Japanese experts. This tends to prevent the flow of accurate information, advice, and instructions, and thus causes occasional misunderstanding. This situation is particularly critical in OJT, the efficiency and success of which heavily depends on verbal communication.

This may cause one to think, then, that manuals could be very helpful for both parties and that the Japanese side could have devoted more effort to improving existing manuals and offering them to the partner.⁶ Japanese companies have begun to respond and the results of their efforts are to some extent reflected in the 27 per cent figures mentioned at the beginning of this paper. In addition, we recognize from our direct observations that the Japanese have tried to upgrade their verbal communication ability on both a company as well as private basis, and have achieved good results on the whole over the past few years.

Another problem that has emerged in the course of OJT abroad is the lack of standardized curricula and methods of technical training. Each Japanese company has an established method of its own for training novice workers based on long experience, but this is not always articulated in the form of a written document. This lack of the standardized methods is felt most strongly when one Japanese expert is replaced by another. The trainees who have become accustomed to the way of teaching of the former trainer employed, and have put personal confidence in him are somewhat disturbed when his successor brings along new ideas, and a lot of friction is created, even if he is better qualified as a trainer than his predecessor. The new trainer may rely to a great extent on his own methods of transferring the technology and his own way of relating to his students.⁷ All these factors constitute very sensitive problems in attaining smoother transfer of technology through the OJT method.

Despite the various demerits of the OJT system, none of the problems seems to seriously affect Japanese technology transfer. Among the growing evidence for this, the most convincing may be the fact that the partner companies are realizing a high productivity, favorably comparable with that of the U.S. and European factories in the developing countries concerned.

⁵ A typical example is the public denouncement in the same line by Prime Minister Mahathir bin Mohamad of Malaysia on August 1983 and by Foreign Minister Ginandjar Kartasasmita of Indonesia on February 1986.

⁶ To a question about what efforts the Japanese should make for more efficient transfer, the recipients pointed to an improvement in conversation ability of Japanese trainers and the quality of documents, including manuals.

⁷ Lively examples for this are given in [8].

This fact may support the view that the choice of strategy for technology transfer made by Japanese companies is, if not the best choice, not a failure but by and large successful. But there still remains the question as to why Japanese companies have tended to emphasize the OJT method which embodies so many disadvantages when applied to technology transfer abroad. We will consider this point in the next section.

III. REASONS FOR LACK OF DOCUMENTATION IN JAPAN

Some Japanese companies are noted for having good operation and work procedure manuals. And those companies who have introduced technology from Western countries make use of the provided manuals and learn how to make them themselves. Many factories in Japan, however, do not in fact employ detailed written manuals of work procedures on the shopfloor.

The necessity for detailed manuals is only felt when they enter technology collaboration with a foreign company. For instance, a leading iron and steel factory in Japan had to design new manuals for work procedure when they received and trained Chinese engineers and workers under a technology collaboration agreement. The thickness of the documents thus produced was about six meters in all. When a leading battery maker, who had no work procedure manuals for its home factories, established joint-venture factories in Eastern and South-eastern Asian countries, it used to operate without sufficient manuals. But when the maker went into collaboration with an Indian company who demanded detailed manuals, its experts compiled a systematic series of documents, the thickness of which extended over one meter.

There are two good reasons why Japanese factories could realize, maintain, and level up industrial technology without the help of manuals on the shopfloor, namely, the Japanese method of technology formation in the factory and the ways in which Japanese carry out business transactions.

A. *The Japanese Way of Skill Formation*

There would appear to be three distinct features with regard to skill formation in Japanese factories. First, workers tend to stay on for a long time in the same factory, particularly in large companies where wages and salaries are higher than in medium- and small-scale companies. During the period of employment, workers, and even engineers, are engaged in various jobs shifting from one to another. As a worker masters one job, he is transferred to a more difficult job. The mastering of skills at various levels is achieved through the OJT method with little reliance on manuals. Every worker at the end of a rotation cycle becomes a multi-skilled worker and this fostering of multi-skilled workers is one of the important goals of the Japanese factory. Workers obtain and accumulate a wide range of skills, knowledge, and technological information in their body and brain. This type of job-rotation is related to job description in Japanese companies which is of a very broad nature. For example, a welder is expected to do not only welding but other related jobs and any other work.

Through experience in various jobs on the production line, a worker acquires not only production skills but also wide technological knowledge. He thus becomes conscious of technical problems in the work to be done by his colleagues further down the production line and tries to do his own work in such a way that they will meet the least technical problems. Such a worker is often moved to the drawing and designing section to work together with engineers in order to help engineers convert a new idea into a practical process more adequately and efficiently. This provides workers and engineers with the opportunity of exchanging technological information intensively and extensively [2]. As a result, when a modification is introduced into the production line, a detailed explanatory document is often not prepared for use by workers on the shopfloor. This is because the skilled worker is himself involved in the modification process. If there was not such a close relationship between workers and engineers, the engineers would have to make detailed procedures instead. And, again, if workers and engineers job-hopped frequently, Japanese factories might have needed well-defined job description and detailed procedure manuals for training new comers to fill vacancies at any given time.

Second, QC circles in Japanese companies and the proposal scheme are related to the provision of manuals. These institutions play a considerable role, alongside that of the R & D department, in the modification and advancement of existing technologies. QC circles, for instance, put forward a tremendous number of ideas and devises to improve economic and production efficiency and quality. It is worth noting that most of these proposals are accepted and put into practice in the form of a change of parts, accessories, or work procedure. Take a leading automobile company, for example, where out of the two million proposals made in 1985, 95 per cent were accepted. These changes occur so fast that there would never be enough time to revise existing manuals to keep them up-to-date.

Third, although standardization of industrial products and specifications are well advanced all over the country, the details of any work process of a given product is not always the same in each factory as every factory has developed its own production know-how. This is one of the salient characteristics of Japanese technology as seen from the viewpoint of the formation of technology and corresponding skills. The know-how nurtured in one factory cannot spread to other factories producing the same product in its final form due to the absence of job-hopping.

B. *The Japanese Way of Business Transaction*

Theoretically, every business transaction, selling and buying of machinery, plant, etc., is a "one for all" action based on a decision-making process that has studied the merits and demerits at a given moment. But a company may take into consideration its whole experience in past transactions with its partners when it decides which firm should be selected for a particular transaction. Japanese firms tend to put emphasis on the latter attitude and seek a long-standing and growing business relationship with specific firms.

The merits of such a business relationship are twofold: first, both parties are almost sure that the other will never cheat and, second, if one party makes a loss in a transaction because of the other party's default, the latter tries to do its best to compensate, if not instantly, in the course of subsequent transactions. It is a well-known fact that the number of litigations between Japanese companies is exceptionally small by world standard.

This custom of business transaction based on mutual trust has a bearing upon the phenomenon of accumulation of technology, particularly process technology, unique to each manufacture. When a customer places an order with an intimate manufacturer for a machine, the former hands over the specifications but usually does not define the work procedure in detail. The method to be used to make the machine to satisfy the required specifications is left primarily up to the manufacturer, at least in the case of established manufacturers [1]. This custom is reflected in the fact that the amount of documentation contained in a business contract in Japan is much smaller than in the West and developing countries.

IV. CONCLUSION

We have pointed out in a schematic manner a unique feature of Japanese companies' technology transfer and explained it as a corollary to the Japanese style of management and business transaction.

There can certainly be two opinions about which style, the Japanese or the Western, is better. But it should be pointed out the technology transfer can be more efficient if the Japanese can provide written documents, even if such provision involves some cost.

An increasing number of Japanese companies are beginning to compile detailed manuals of operation and work procedures in response to requests when they enter into technology collaborations abroad. One Indian company interviewed commented that its Japanese partner was very slow in supplying manuals as it was having to make them for the first time. Noteworthy here is the case of a Japanese manufacturer who recently completed for the first time a systematic manual of work procedure, in response to requests from a Thai company. They told us that it took a long time and cost a lot but that they were able to review and rationalize some of their processes through this exercise.

The making of manuals might be required in the future as the situation changes in Japan as it appears that job-hopping is increasing in Japan, too, particularly in the latest technology industries. A newspaper report said that a fast-expanding company in such fields recruits employees from time to time and that it has made manuals covering about 70 per cent of its daily jobs [5].

When making manuals for use in a foreign climate, they should take into account the differences from Japan, such as the lower level of skill and experience of local workers, electric power fluctuations or failures, and so on. We are concerned, at the same time, that quite a few recipients wrongly consider that manuals are almighty, and that a technology is taken to be transferred successfully when a manual is handed over. Technology is, and has to be, frequently upgraded

and manuals have to be revised accordingly. In this respect, no manual is ever really complete.

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