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PRODUCTION MANAGEMENT IN JAPAN BEFORE THE PERIOD OF HIGH ECONOMIC GROWTH

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* The opinions expressed in this document are those of the author and do not necessarily reflect the views of the United Nations Economic Commission for Western Asia.

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Japan's industrialization process is now widely regarded as a model for developing countries, and has been investigated and discussed from various angles. But there have been extremely few studies of the period from the beginning of the Second World War to the Korean War (1937-1950), though such studies are surely essential for the understanding of the rapid economic growth after the Korean War. This paper is intended to survey the development of domestic production management in Japan during that period.

The theme of production management was adopted for reasons connected with the history of industrialization. In every country, industrialization seems to have encountered a problem of managerial reform when it reached a certain stage of development. Among the various ways of identifying this stage, perhaps the beginning of mass production of durable consumer goods is most important. Industry in the United States passed through this stage in the period from the introduction of Frederic Taylor's scientific management theories to the development of the Ford system. The European countries also seem to have experienced managerial reform problems between the two World Wars,[1] regardless of their economic system: the USSR may be regarded as having them in the period from the Stakhanovich movement to the post-war economic reform under Kruschev and Brezhnev. And now the People's Republic of China too is beginning to empahasize the importance of production management. These common facts seem to indicate the existence of a stage which every country must pass through en route to industrial maturity.

Japan's industrialization process encountered this problem stage in the period between the Second World War and the Korean War. A study of the development of production management in this period will, therefore, be crucial for the understanding of both the industrialization process itself and the later economic growth of Japan.

lack of technical training, and inferior workmanship. Workers waste a lot of time in preparing their work or in chattering on the shop-floor while supervisors are drinking tea at their desks. Their work intensity curve is "hill shaped": at the beginning of the workday there is virtually no work. Then intensity increases slowly towards a peak, but top intensity is maintained for only one or two hours, and then begins to fall towards virtually no work at the end of the day."[3]

But it was not only the workers who were responsible for the extreme inefficiency of wartime production; rather, it was mutual influence of many factors. For instance, throughout the war the aircraft and heavy vehicle industries suffered from a permanent shortage of forged material for crank-shafts, coupling-rods, cam-shafts or valves because of the low productivity of the hand forging on which machine manufacturers depended. Though the government planned to introduce die forging, two obstacles stood in the way. One was the lack of suitable steel: wheras a die made from Japanese steel was good for less than a hundred forgings, one imported from the U.S.A. could stand ten thousand. Another was the lack of die cutting machines, for which Japan depended exclusively on the U.S.A.. The government forced several machine-tool manufacturers to produce copies of the machine, but without success.[4]

Just before the war, in anticipation of wartime interruption of foreign trade, Japan imported a huge number of machine-tools from the U.S.A. and elsewhere. The fact that no die cutting machines were included shows again the fatal ignorance of leaders about the nature of mass production. Ignoring the single-purpose machine-tools indispensable for the construction of mass production lines, they imported mainly high-quality universal machine-tools. The production line in which a long array of expensive universal machine-tools were doing very simple and elementary machining was a common scene in aircraft plants of wartime Japan.[5]

The government, becoming gradually aware of the importance of production management, began to work out political countermeasures. But the training of new industrial engineers could not bring immediate results, and so in 1942 conventional two industrial engineering consultant agencies were amalgamated to establish the Japan

Efficiency Association (Nippon Noritsu Kyokai). Receiving the strong support of the Ministry of Commerce and Industry, its main duty was to advise on production engineering. A group of scientists was also organised, the Group for Statistical Research (Tokeikagaku Kenkyukai) which in 1941 started research and development on statistical methods in production management. However, these measures were also too late, because by 1943 the most serious problem for production was shifting from management to the shortage of raw materials resulting from attacks by American submarines. Thus in 1944, with the beginning of the strategic bombing of the Japanese islands, Japanese wartime production began to decline rapidly to its catastrophic end.

However slight it might seem, this wartime experience had a strong bearing on the post-war development of production management in Japan. To understand this wholly we have to go back to the early history of Japanese industrialization.

Scientific management has had a long career in Japan. As early as 1911 part of Taylor's work was translated into Japanese.[6] Around that time, Ueno Yoichi, an enthusiastic proponent of Taylorism, began his educatinal activities. His movement found many supporters in governemntal or municipal offices as well as in some sectors of industry, such as arsenals, the National Railways, and electrical appliance manufacturers. Many attempts were made to apply Taylor's principles on shop-floors, but scientific management made little headway. This could be attributed to various causes: the workmanship referred to above, the paternal nature of Japanese companies, Japan's backwardness in science education, but above all, we must emphasize the fact that there had never been fully developed mass production lines in which such management techniques would prove their true merit. Therefore, it was more an educational than a practical movement, whose propagandists, like Godo Takuo above, always complained of the low efficiency of Japanese workers in contrast with their Western counterparts working under ideal scientific management.

Wartime production was thus an epoch-making experience, in which Japanese scientific management found for the first time a vast field for application and experiment. Though both failed utterly, people concerned learned much from the failure, and passed the lessons to the post-war era. The Japan Efficiency Association had train-

ed over three hundred industrial engineers, and these would constitute the basis for post-war development. Moreover, both the Japan Efficiency Association and the Group for Statistical Research had developed some techniques and study manuals which remained useful. But perhaps even more important were the personal connections established through the experience between engineers in government and managers in industry. Since the Meiji Restoration, the Japanese government had been hiring many university-graduated engineers and scientists in the National Railways, the Ministry of Commerce and Industry, the Ministry of Agricuture and other departments. However, they had always ranked low in the bureaucratic hierarchy, and were excluded from both policy making and industrial administration. Although engineers formed departmental clubs and for years requested higher status, it was only during the war production that they were given for the first time full responsibility for policy making and industrial administration. Their first experience resulted in failure, but they learned much about the practical problems of production, and made many personal connections with leaders of private industry. The close collaboration between government bureaucrats and company managers in post-war reconstruction developed more or less on these connections.

To sum up, a lesson was learned in the importance of management for production, as well as that of industrial engineering for management. Many young engineers, managers, and bureaucrats who were to constitute the basic personnel of post-war production were deeply impressed after seeing the catastrophic confusion that lack of 'scientific' management had brought about in industrial production.

2) The post-war economy and the role of the U.S. military occupation.

Post-war reconstruction started with the production of the necessities of life alongside the renovation of railway and telecommunications networks destroyed by the bombing. As is well known, Sony began its career in industry by producing electric bread oven which, though extremely primitive as electric appliances, were truly useful for preventing destitution. The stituation was similar with other companies,

who manufactured products required for daily life using materials left over from wartime production. The government adopted the so-called "priority production system" (Keisha Seisan) policy, giving priority to three key-sectors: iron and steel, chemical fertilizer, and coal mining. These were intensively protected both financially and materially, and production recovered rapidly. As regards the reconstruction of industry as a whole, however, there was no unified opinion nor definite policy. Though discussions had started concerning the long range policies for industry and technology, there was no clear vision of the industrial future of Japan beyond one undeniable fact: as a result of the loss of the colonies, Japan would have to construct its industry in the absence of natural resources. An interesting discussion, found in the organ of an engineers' union to which we shall refer later, concerned the type of automobile which Japan should produce in the following decade. Four leading industrial figures disputed, sincerely and enthusiastically, whether it should be powered by charcoal, coalite, or electricity[8]. All was thus in chaos.

It is significant that, amidst such chaos, a private managerial consultant firm achieved perhaps the first success in Japan. The Japan Efficiency Association, deprived of governmental support after the war, reorganized itself and split into two organizations. The one was the Japan Industrial Standards Association, which collaborated closely with what later became the Ministry of International Trade and Industry (MITI) in promoting standardization in industry. The remaining members organised themselves in the Japan Management Association (JMA) which was a small private managerial consultant firm with a dozen or so consultants. The JMA began its consultancy work in November 1945 with a visit to the Kasado factory of Hitachi Ltd. which manufactured rolling stock for the National Railways. Its business activities grew with the economic recovery, and by 1950 the JMA had become an influential managerial consultant firm with over fifty people in its consultancy department. "We responded to even the most minor requests, as far as they related to the improvement of efficiency" relates a short history of the JMA[9]. But there were many factors which contributed to this success; Matsuo Takashi of the JMA points out the following three: 1) the historical factor

- that is, the National Railways had long nourished engineers favouring scientific management; 2) personal connections in many companies established in wartime; 3) management techniques and systems developed by the Japan Efficiency Association during the war. The first two were helpful for marketing, while the aided actual consulting activities.[10)]

We can verify Matsuo's arguments by a look at Table 2, which shows the annual frequency of visits to factories classified according to the business of the customers. In 1946 JMA's business depended mainly on requests from two sectors: telecommunications appliance manufacturers and rolling stock manufacturers. The latter suggests help from sympathizers in the National Railways, and the work is said to have been the rationalization of assembly lines and repair lines by the application of typically Taylorist principles. It must also be noticed that, though these were the most important sectors in industrial reconstruction, the former was given special priority by the U.S. occupation forces perhaps because of its importance for military operations. GHQ(the General Headquarters of the U.S.Forces) especially promoted the rationalization of production lines in this sector. Table 2 shows clearly that demands from this sector supported the business of the JMA from 1946 to 1948. While the three key sectors were flourishing, they paid little heed to the improvement of management, partly because they were spoiled by heavy protection. Middle-size steel mills and machine builders, which constituted an important part of the customers, had to deal with many orders using relatively poor and worn-out equipment. The so-called "Control-unit System"(Suishin-ku Kanri-ho) was extremely useful for production management in these factories.

The method had been developed for the production management of aircraft, where there was a huge number of parts, but where assembly was not so mass-productive. A work-team of suitable size constituted a control-unit, in which the responsibility for preparing the work schedule was put in the hands of three workers: the foreman of the team, an inspector from the insepection section and a control worker of the unit. They collaborated closely in preparing work schedules and controling the process in their unit in accordance with indices supplied by the process cont-

rol section. These indices reflected a balance of the relative rates of progress in the manufacturing of each part, and the control section intervene in a unit only when production proceeded too fast or too slow. Computation of indices was done according to Taylorist methods. In this way the progress of work in every section of the factory was regulated in accordance with the final assembly process, and a considerable saving was achieved in control costs as well as in goods in process.[11]

It could hardly be said to be a sophisticated method, but it could be said to be a logical result of the long study of Taylorist scientific management in Japan. And above all it was especially suited to the many machine builders beginning to manufacture considerably complex machines in middle-sized lots. Successes for the method in companies such as Daihatsu, Cannon Camera, Mitsubishi Shipyard and others created a sensation among managers of the time.

The methods diffused in this period were, however, rather old-fashioned Taylorism; industrial engineers in the JMA as well as in many companies were gradually becoming aware of the enormous advances in managerial techniques achieved in the U.S.A. and Britain during the war, and began to study those techniques. Meanwhile, GHQ officers in the Economy and Science Section(ESS) and the Civil Communication Section(CCS), deeply concerned with the backwardness of production management in Japan, began their effort to educate Japanese engineers in advanced techniques of production control. As I have written above, they were especially interested in the reconstruction of telecommunication networks, but Japanese telecommunication appliance manufacturers then suffered from many troubles in their production lines. For instance, at Nippon Electric the rate of unacceptable valves for oscillators amounted to 60%![12] CCS officers held several seminars and lectures, mainly on statistical methods of quality control. Many Japanese engineers and managers were deeply impressed by the mathematical and scientific nature of the methods, and reflected again upon the backwardness of Japanese production control since the war. Among them was Ishikawa Ichiro, president of the Federation of Economic Organizations(Keidan-ren), and at the same time the first president of JUSE, which will play the leading role in the next part of this section.

JUSE, the Union of Japanese Scientists and Engineers, was inaugurated on 1st May 1946. There was a big difference between JUSE and JMA. While the former was intended at first as an organization for the establishment of industrial democracy, the latter was a mere private consultancy firm. Following on from the above-mentioned engineers' movement for equality of opportunity, membership of JUSE as an engineers' union comprised mainly engineers in government offices. The engineers' organizations in the National Railways, the Ministry of International Trade and Industry, the Ministry of Posts and Telecommunications, and 11 others constituted the basic membership, though special membership was permitted for engineers in private companies.

JUSE News No.1,dated 25th July 1946, carried on its frontpage the slogan "For a People's Front in Science and Technology". Nevertheless, JUSE hadn't become a trade union of engineers. Post-war reconstruction offered a vast field of activities for engineering officers in government, and they worked confidently as technocrats rather than as discontented engineering workers. The members from private companies were also top managers rather than engineering workers. Consequently, in its first two or three years JUSE was actually a sort of club for government technocrats and top management.[13] In fact, JUSE opened the Engineer's Club in a building near Tokyo station and organised there many conferences for engineers and managers, in which problems of science and technology in the post-war economy were discussed enthusiastically. In 1949, the Agency for Economic Stabilization submitted to JUSE a project to investigate the technical level of foreign industry. JUSE organised a committee for each important sector of industry, and five committees set to work immediately. There were two important results: first, through this activity many university professors came to combine with JUSE, and second, the technically-backward points of each sector were clarified concretely, contributing considerably to technical improvement in the early stage of high economic growth.

Among these committees, the most active was that concerned with factory management. From the start it planned to combine its investigation with educational activity, and under its leadership, from September 1949 JUSE opened the first Quality Control Seminar, in which 33 engineers of leading big companies were train-

ed intensively in statistical method of quality control. This positive reaction can be attributed to many factors. Firstly, through the efforts of GHQ officers considerable information about the progress of U.S. quality control during the war had already been brought into Japan. Secondly, the wartime Group for Statistical Researc had nourished domestic researchers in statistical methods who could easily understand these new techniques and who constituted the teaching staff of the seminar. But above all we must emphasize the role of a mood prevailing among engineers and managers after the war. "Engineer's Club", the organ of JUSE, argued on 3rd August of that year:

"We are deeply impressed to find recently that in Britain and the United States statistical quality control developed enormously during the war. ....

Why couldn't we have such refined management technique? .... Every Japanese will remember the fact that our industry produced during the war innumerable planes which couldn't keep aloft for long enough to meet any enemy plane to fight with. Many promising youths had to be lost in Pacific Ocean because of our formidable production control without a bit of scientific spirit. It is even more regrettable, however, to find a lot of company managers still believing now that such a refined technique is not suitable to the methods of 'backward Japan' This is a terrible complex which will keep Japan permanently as an underdeveloped country. .... We must be aware that cheap and intensive labour or old craftsmanship is of no use for modern industry now.... If our manufacturers want to keep up the competitiveness of their products in the overseas market, the only thing for them to do is to adopt this technique right now."

Here we may observe the experiences of wartime combining with the necessities of the post-war economy to constitute an enthusiastic passion for scientific production management.

3) The emergence of the so-called QC movement.

The next action of the factory management committee was to invite Dr.Edward

Deming, whom GQH officers had recommended to JUSE as an excellent instructor in SQC (Statistical Quality Control). Deming visited Japan from July to September of 1950, attending many seminars, and enchanted science-oriented Japanese managers by his clear and practical lectures. He revisited Japan almost every year for the next few years, and, gathering every time many new admirers, became a symbol of SQC in Japan. JUSE provided the Deming Prizes to be given annually to the individual and company most outstanding in the promotion of QC(Quality Control). Many manufacturing companies began to energetically promote quality control while competing fiercely with each other to get the Deming Prize. JUSE also held seminars entitled 'QC basic course' for the education of quality control techniques. Initially held once a year in Tokyo, it was then increased to twice a year, and finally held in both Tokyo and Osaka, and thus many engineers were trained in statistical methods of quality control; JUSE claimed in 1979 to have trained over fifteen thousand QC engineers since then.[14] Once a year a general meeting of QC was held in Tokyo, at which experiences of applying SQC methods were reported and discussed eagerly. From the factory management committee derived a committee editing texts, and many excellent descriptions of control-charts, sampling, testing, design of experiemnts etc. were published. The monthly "Quality Control" was also published as an organ of the movement. The QC movement thus developed rapidly and covered almost all the active sectors of industry: textiles, iron and steel, chemicals, telecommunication appliances, etc.. It was a feverish movement of immense interest, perhaps more so from the view point of social psychology than that of technology.

This rapid development was greatly helped by economic circumstances. As we have already seen, the priority production policy didn't stimulate efficiency mindedness in key-sectors, though it was successful in the early stage of reconstruction. However, the growing inflation accompanying this policy forced the government to stop heavy protection of key-sectors in 1949. A new policy was substituted, intended to promote export and consequently strengthen the competitiveness of individual manufacturers. The policy was to select promising companies in each sector and pressure them while helping them rationalize their production lines, spurring management to

improve not only production lines but also the 'quality' of their products. Meanwhile, in June 1950 the Korean War had broken out. The government as well as the GHQ took advantage of the situation to suppress and destroy the radical wing of Labour. The first step of the rationalization of post-war Japan's industry was thus achieved without severe opposition from Labour. Special procurement by U.S.Forces brought a boom in the machine, metal, and textile industries, accelerating business activities in all sectors, as a result of which 1951 production surpassed by 30% the average level of 1932-6.

Reflecting this situation, the promoters of the QC movement in its early stage were found largely in the key-sectors. Here is the list of Deming Prize awardees: first year: Yawata Steel and Fuji Steel (later merged into Nippon Steel), Tanabe Seiyaku(chemical), Showa Denko(chemical); second year: Asahi Chemical Industry, Shionogi & Co.(chemical), Takeda Chemical Industry, Toyobo(textile), Nippon Electric, Furukawa Electric; third year: Kawasaki Steel, Sumitomo Metal Industries, Shin-etsu Chemical, Tokyo Shibaura Electric; and so on.[15] All are companies which later led industry in the period of Japan's high economic growth. In this early period, their factories had still to recover fully from damages caused by the war. Worn-out equipment, unstable supply of electricity, and low quality of raw materials caused innumerable disturbances in their processes. Statistical methods were extremely effective aids for analysing the correlation of all the factors in the process and finding the cause of the disturbances. Consequently, remarkable effects appeared as soon as such methods were adopted. Showa Denko, for instance, within a year of their introduction succeeded in decreasing the basic unit of electricity needed for the production of chemical fertilizer by at least 10%. It also remarkably increased the rate of operation of worn-out nitrogen separators in the same period.[16]

It was not only SQC which was urgently needed in industry. Companies were searching for all managerial techniques that could assist rationalization. The JMA also, therefore, greatly expanded its business in this period. SQC was particularly effective when it was introduced into a production line which had already been rationalised along Taylorist lines; a typical example was the telecommunications sector. For

instance, Nippon Electric, after the early guidance of CCS officers, had considerably rationalised its production control system with the help of the JMA. Then by introducing SQC methods on a large scale, the system was made still more effective. In this period, Nippon Electric was beginning to produce products of high quality and to be widely regarded as a model of QC. It must be emphasized that most of the leading firms in the period of rapid economic growth had in more or less similar ways established their own comparatively-rationalised production management system in this period.

Meanwhile an important change was taking place with regard to Labour. As is well known, Taylorist management was based on planners and executives. It deprived workers of initiative in the work process and put them in the hands of industrial engineers. SQC also largely depended on the initiative of engineers, and had a similar effect. With the progress of rationalization it was noticed that a deep gulf developed between lower managers and shop-floor workers, hampering the functioning of the quality control system; after all, the quality of the manufactured products was largely determined by the quality of the work done by the workers who manufactured them. Control of quality had to involve control of labour. On the other hand, rapid rationalization of manufacturing processes was necessarily accompanied by the dismissal of many workers, and consequently by frequent strikes against it. Through these strikes the General Council of Trade Unions of Japan(Sohyo), organised in 1951 as a rather moderate wing of the labour movement, was developing into a radical opponent of rationalization in industry. The second post-war decade was to be one of a life-and-death struggle between Labour and Management for and against the rationalization.

In this period, both JUSE and JMA tried carefully to keep a neutral position between Labour and Management. Theoretically it was impossible because, as already shown, quality control had to involve control of labour. But actually it was possible in Japan. Japanese workers, accustomed to lifetime employment, were extraordinarily sensitive to the dismissal of their fellow workers, not to say their own. Other areas of high concern were of course wages, work intensity, working conditions in

their shop, recreational facilities in their firm etc. Usually, matters of the job, such as skills, training, work specifications, and the speed of assembly lines, were outside the scope of trade unions. This phenomenon might have come from the lack of any tradition of craft union movement in Japan; but a detailed discussion of it is beyond the scope of my paper.[17] Anyway, in such conditions, union leaders tried to organise the movement against rationalization as a movement against dismissals and work intensification. This strategy was relatively successful, but as a result many demands of workers concerning their jobs were neglected. Industrial engineers could thus freely continue their rationalization plans so long as they kept themselves carefully outside the area which unions regarded as their own concern. This was the attitude which was adopted by JUSE and JMA.

In 1955, Management, seeking to promote a labour-capital reconciliation so as to expand productivity, launched the Japan Productivity Center(JPC). The government supported the move and subsidized the Center, but both JUSE and JMA were strongly critical. Thus we read in "Engineer's Club" No.81, dated 10th February 1955, that representatives of JUSE, JMA and the Japan Industrial Standards Association, after discussing the JPC plan agreed that it had two harmful aspects: it neglected experts who had been working for a long time on the shop-floor to improve productivity, and, secondly, it failed to realize that workers would regard management's call for expanded productivity as a call for intensifying their work. The criticism might well be said to have been correct. All through the second post-war decade which began in 1955, workers regarded the JPC as the headquarters of Management for planning the destruction of the labour movement; "productivity" became a key-word symbolizing the maleficent will of Capital. In contrast, the word "quality" incurred no ill feeling among either workers or union leaders. This fact was decisive for the next step in the development of QC movement.

Around the same time, industrial engineers on the shop-floor were struggling to implement a system of "tripartite cooperation"[18] between top management, engineering staff and shop-floor workers, called the TQC (Total Quality Control) system. The concept of "quality" was extended so as to involve the cost and fidelity of products.

Thus, such areas as sales, services, procurement, inventory tasks, and various kinds of office work were included among activities concerned with "total quality". Many new techniques of controlling these work were implemented. Despite the elaboration of this total system, however, engineers were finding it hard to sell it to the workers, so deep was the gulf between them and lower management. Furthermore, as rationalization progressed, a growing sense of alienation diffused among the workers, resulting in absenteeism, lowered morale, rapid turn-over of the work-force etc, and threatening the overall efficiency of the elaborately designed system.

Various new modes of management were tried, especially by domestic electric appliance manufacturers in their well developed mass production line, in which the demoralisation of workers was most serious. The essential thing was how to induce the initiative of the workers, and many experiments were attempted, entrusting workers with a considerable part of the decision-making. The ways in which this was done were more or less on the lines of the development of "Control-unit System" by the JMA. The whole production process was divided into units according to the nature of the process and the job involved. Within a unit all members, not just three as in the case of the control-unit system, were encouraged to participate in decision-making using some indices given by control engineers. What sort of decisions were entrusted to workers varied according to the policies of particular companies, but usually included quality control of the process within the unit. In these experiments some companies also planned to teach shop-floor workers elementary SQC techniques previously regarded as engineers' territory. The trial was successful and encouraged many industrial engineers to develop simple but practical SQC methods for application on the shop-floor.

These experiences led JUSE to the idea of the "QC circle" which was to constitute one of the basic elements of the later Japanese style of production management. The QC circle differed from the small group in the above-mentioned experiments in one important point: while the latter was compulsory, the former, in principle, was voluntarily organised by workers as an after-hours activity. This difference is important, and perhaps explains the success of the QC circle movement. Compul-

sory involvement of workers' initiative in the TQC system was impossible, but workers' initiative encouraged through voluntary activities contributed enormously to the 'quality' of the products they manufactured. With the QC circles, Japanese production management might well be said to have taken off from a stage of absorbing foreign technology to its free and creative development. By 1979 QC circles in Japanese industry exceeded a hundred thousand.

4) Conclusion.

I have surveyed the development of Japan's domestic production management mainly alongside the activities of two influencial agencies: the JMA and JUSE. Needless to say, the contribution of other smaller agencies also should not be neglected. For the later development of management in Japan, studies written in non-Japanese languages can be found rather easily. Here, I have concentrated my discussion on a period comparatively unknown to foreign observers. In concluding the paper, I would like to emphasize first of all that Japan had substantially completed the process of managerial reform before she commenced high-speed growth.

Managerial reform does not proceed in isolation from the progress of industrial development. It usually proceeds alongside standardization in many fields and perhaps accompanied by the development of machine-tools. All may reflect the needs of an industrial stage in which the complexity of both the production process and the manufactured products has surpassed a certain level. Japanese industry reached this stage just before the Second World War in a somewhat forced way, and perhaps completed the necessary refoms around the end of the first post-war decade, that is, just before the commencement of high-speed growth and the intensive import of foreign technology. Every student of technology transfer or economic growth in post-war Japan must take this fact into consideration. The fact is also strongly suggestive when we consider why the People's Republic of China meets with such serious difficulties in pursuing both intensive import of foreign technology and managerial reform at the same time.

Managerial reform is also accompanied by serious conflicts between Labour and Management; there are considerable differences between Japanese and Western workers in the way they reacted to it. A further comparison will teach us much about the difference of work climates between various countries.

It is interesting that the idea of scientific management in Japan, though introduced so early, remained for many years a mere educational idea with no wide application in industry. Comparable situations will often be found in developing countries. However, once industry reached the stage which needed it, it was those educational pioneers who provided the basis for required managerial reform. Though this reform proceeded largely under the influence of the United States, especially of GHQ officers, the Japanese experts with their wartime experience built upon the advice they received and developed the technique of scientific management even further than the United States had done. Much of the effort put into wartime production was especially important: specially developed primitive methods; the industrial engineers hastily trained in this period; mathematicians and other students experienced in statistical methods; all combined to constitute the basis for post-war development. Thus we can say that without fifteen years of struggle for technological independence from the United States, the techniques tranferred from that country after the war could not have taken root in Japan.

Perhaps most interesting of all, all through the period discussed, the government seems to have had no definite policy for managerial reform except when the Japan Efficiency Association was established. During the war as well as after, the government exerted much effort to promote standardization in industry. The post-war MITI also designed meticulous policies for technical progress in the machine-tool industry. But towards managerial reform there was no explicit policy. This was perhaps partly because of American influence, since GHQ officers believed that this field of activities should belong to free enterprise. But most of all, it was due to the close personal connections between industrial bureaucrats and business management in the post-war economy. They could hold discussion in the engineer's club whenever necessary, and the most frequently discussed topic was managerial reform. When we consider the fact that the explicit government support, as in the case of the JPC, evoked strong labour opposition, the effectiveness of this type of implicit cooperation deserves our attention.

Lastly I would like to add a comment about the purpose of this paper. The main object has been to show the state of Japan's production system before the period

of high economic growth. Managerial reform is treated as an index of a certain stage in the development of technology and production. Detailed discussion of the Japanese style of management itself, especially of its negative aspects is therefore excluded, and must await another opportunity.[26]

1) About the managerial problem in Europe betwee the wars and its social meaning, George Friedmann's work is suggestive; see La crise du progres, Gallimard (1936), and Problemes humains du machinisme industriel, Gallimard (1946). Univ. of Minnesota Pres (1949), chap. 4.
2) J.B.Cohen, Japan's Economy in War and Reconstruction,
3) JMA ed. Sixty years of Management, JMA (1972), p.64.
4) Okumura Shoji An Eye upon the History of Technology(Gijutsushi o miru Me) Gijutsu to Ningen-sha (1977), pp.66-68.
5) Ibid. p.70.
6) Ikeda Toshiro translated part of Taylor's work and published it in a series of newspaper articles under the title "How to dispense with useless tasks".
7) JMA ed. Ten years of the Japan Efficiency Association, JMA (1952), p.55.
8) "Engineer's Club" No.5, 3rd October 1948.
9) JMA ed. A Short History of the JMA, JMA (1980), p.6.
10) From personal conversations with Matsuo.
11) One rolling stock assembler was said to have saved seventy million yen per quarter by application of this system; see Ten years of the Japan Efficiency Association, p.66.
12) "Engineer's Club" No.19, 3rd December 1949.
13) But after the beginning of the QC movement it was widely regarded as a sort of QC consutancy agency.
14) Tamura Yasushi and Noguchi Junji, Recent Advancement of the QC circle, JUSE (1979), p.8.
15) JUSE ed. Thirty years of the Deming Prize, JUSE (1980), p.10.
16) "Engineer's Club" No.25, 3rd June 1950.
17) Kumazawa Makoto, Non-dependence of Non-elite - what is a trade union? - (Non Elite no Jiritsu), Yuhi-kaku (1981), chap.6 discusses this problem persuasively.
18) Tamura and Noguchi, op.cit., p.7.
19) Ibid., p.20.
20) Nakaoka Tetsuro, "Work and Work-organization in Japan during the Period of High Economic Growth", a chapter in a book forthcoming from the Institute for Economic and Social Studies of East Asia of Bocconi University, Milan, will treat part of these problems.

Table 1

Sectors	Name of Japanese Company	Year of establishment	Name of Foreign Parent Company	Stock holding of Parent Company
Electric Machine	Nippon Electric,	1899	Western Electric,	54 %
	Tokyo Electric,	1905	General Electric,	55
	Shibaura Ltd,	1908	General Electric,	24
	Fuji Electric,	1923	Siemens,	30
	Mitsubishi Electric,	1924	Westinghouse,	40
	Toyo-Otis Elevator,	1932	Otis Elevator,	66
	Sumitomo Electric,	1932	I.S.E.,	13
	Toyo Western,	1929	ERP,	100
Rubber	Yokohama Rubber,	1917	Goodrich,	50
	Chuo Rubber,	1917	Dunlop,	100
Passenger Car	Nippon Ford,	1925	Ford,	100
	Nippon G.M.,	1927	General Motors,	100
Sheet Glass	Nippon Sheet Glass,	1918	Libby Owens,	34
Artificial Fiber	Asahi Silk,	1924	Glanzstoff,	25
	Nippon Bemberg,	1929	J.P.Bemberg,	25
Record	Nippon Gramophone,	1927	Columbia,	59
	Nippon Victor,	1929	R.C.A.	68
Other Machines	Nippon Steel Works,	1907	Vickers-Armstrongs,	50
	Toyo Boiler,	1928	Babcock and Wilcox	66
	Kyosan Seisaku,	1928	United Steel&Signal,	20
	Toyo Carrier,	1930	Carrier Corporation,	50
	National Cash Register,	1935	National Cash Register,	70

Table 2 : the annual frequency of visits to factories by the JMA.

Sectors	Frequency of visits per year						
	1946	1947	1948	1949	1950	1951	1952
Rolling Stock	6						
Telecommunication [1]	9	8	13		3	5	7
Machine & Metal Mill [2]	7	12	15	13	16	15	26
Mining	3	5	9	12	22	12	12
Textile	3	4	6	8	16	16	9
Chemical		3	9	10	10	8	9
Paper [3]					25	8	6
Durable Consumer Goods [4]			4	4	17	9	22
Others	7	9	15	12	18	28	21
Ship			1	1	3	1	3
Automobile			1		1	8	11
Big Iron Works				1	4	3	8
Total	35	44	73	61	135	113	134

1) Including cable manufacturers.
2) Middle-sized mills.
3) Including lumber industry.
4) Excluding Passenger car assemblers.