

Part—III

## **The Growth of Enterprises and In-Company Training**

## **Industrialization and In-Company Training**

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### **I. Technical Education and In-Company Training**

For a non-Western country such as Japan to have succeeded in industrialization, a sociocultural structure and mechanism existed which enabled people to internalize those abilities necessary for industrialization. The structure and mechanism were enforced prior to industrialization through the introduction of a modern educational system that was responsible for the diffusion of primary regular education and the establishment of technical education. Public education and in-company training played a major developmental role. Nevertheless, the structure and function of education as key factors in Japan's industrialization have not been analyzed sufficiently. Even though there have been some studies on the establishment of the educational system and the circumstances of the in-company training system, relatively few attempts have been made to analyze the correlation between the two. One case study<sup>1</sup> measured the contribution of public education to economic growth through the use of quantitative indices such as the public school enrollment ratio and figures pertaining to governmental financial subsidies; however, no mention was made of the function of public educational institutions by level and type. There is not yet any conclusive understanding whether regular education or technical education has contributed more to industrialization.

The reason there has not been sufficient analysis regarding the role played by education as one of the factors in Japan's industrialization can be attributed, on the one hand, to a lack of interdisciplinary analysis

encompassing the fields of educational history and business history. On the other hand, studies pertaining to the development of various types of training in industry have only just begun.

The main purpose of this chapter is to clarify the relationship between in-company training and technical education provided by public schools and to address the problem above through a hypothesis by which the above relationship can be analyzed. The comparison will be between technical education at the secondary level and in-company training, since another study has analyzed the development of higher technological education.<sup>2</sup> The history of public technical education at the secondary level goes back to the opening of the Tokyo Worker Training School (Tokyo Shokkō Gakkō) in 1881. The training of foremen was one of the initial objectives of this school. The transformation which this school subsequently underwent was a history of continued upgrading to that of an educational institution of a higher level.<sup>3</sup> Secondary level technical education on a nationwide scale began in 1894 when the Apprentice Schools Act (Totei Gakkō Rei) was enacted. To examine the correlation between public secondary level technical education and systematized in-company technical training, a theoretical framework for an understanding of the two is outlined below.

When one system was organized prior to the other, it could be said to be performing a "pioneering function." When a function of one was taken over by others it became a "substituting function." When other institutions assisted a function which was insufficiently carried out by an educational training system, their function could be said to be a "complementary function." When there was a relationship of systematic cooperation and affiliation between the two, this could be classified as an "affiliating function." An important factor for these relationships and functions was whether a preceding or a subsequent relationship existed between the two. A dominant-subordinate relationship of the two was mutually determined by whether there was an earlier establishment and improvement of either public secondary level technical education or in-company training.<sup>4</sup>

Concerning the relationships between public technical education and in-company training, the first point pertains to the correlation between systematized technical educational institutions and their actual functions. The system's aim and its reality did not connect when a dichotomy existed between laws and regulations and implemented facilities and equipment which formed the basis and function for particular technical institutions of the intended educational training. One example of the above was that, in reality, few apprentice schools

functioned in accordance with the intent despite the enactment of the Apprentice Schools Act and the establishment of policies to modernize the traditional apprentice system. Furthermore, contrary to the original intention, technical continuation schools established on the basis of the Regulations for Vocational Continuation Schools (Jitsuigyō Hoshū Gakkō Kitei) enacted in 1893 remained stagnant for a long time because of a gap between the ideal and the reality.

The second point is the demand-supply relationship of the technical labor force. Even though a system of technical education materialized through anticipatory investment, it was difficult for the system to function when there was a paucity of demand. There was a demand-supply discrepancy because the quality of worker being trained through public technical education did not meet the standard required by the various industrial enterprises. Despite the quantitative expansion of industrial manpower supplied by secondary-level technical educational institutions being developed in the first half of the twentieth century, industries did not necessarily welcome this expansion and expected the schools to train midlevel workers. Therefore, a discrepancy existed in the demand supply relationship regarding the quantity and quality of skilled workers.

The third point pertains to the systematization of in-company technical training. As will be shown later, prior to the establishment of the in-company technical training system, an in-company apprentice system different from conventional apprenticeship was developed. A trainee system and regulations regarding the employment of workers were established within the companies, and there were cases whereby these subsequently developed into full training systems for skilled workers. In the transformation of the in-company skilled worker training system, two additional factors must be considered: a changed employment pattern of skilled workers from indirect employment on the basis of a sub-contract system to direct-contract employment; and the role of on-the-job training and emphasis on on-the-job experience. While these factors regulated the form of in-company training, they also exerted direct and indirect influence upon the formation of a technician training system.

Limiting the skilled worker training system to that pursued primarily by in-company training, its functional correlation to the school system and its transformation will be examined mainly with the use of case studies. The early stage pertaining to the systematization of skilled worker training will be analyzed first and next its transformation in the diffusion stage will be analyzed. Despite the diffusion of the in-company skilled worker training system, the opportunities for such training were

provided only by big businesses. Thus, as a third point, it will be necessary to discuss the process of skilled worker training in small and medium enterprises.

## II. In-Company Training in the Early Industrialization

For the purpose of international comparison, three characteristics should be noted in the formative history of in-company training in Japan. First, the introduction of technological education, which accompanied the introduction of technology, gave technology important momentum. Second, funds for educational training were invested prior to the establishment of large-scale state factories. Third, a typical system of in-company skilled worker training was carried out by key industries such as shipyards and machine factories. In the initial stage of industrialization in-company training was primarily found at state-run factories during the process of technological introduction. In other words, technical education was a concomitant to technological introduction. Although foreign engineers and workers were at first entrusted to give informal training, a formal training system was subsequently institutionalized at various bureaus in the Ministry of Industry.<sup>5</sup> The School of Engineering (later the College of Engineering) under the Engineering Education Bureau of the Ministry of Industry was the only public educational institution. Even though this school was exceptional, other organized facilities for mastering Western technological skills were established based on various training systems founded at some bureaus of the Ministry of Industry and at the Yokosuka Shipyard. Together with the rise of private industries after the sale of state-run industries to private enterprises, the skill transmission system and the training system which had existed under state ownership became model systems. The need to procure a labor force was the basis for the formation of a more organized technical training system. The origin and content of the technical training systems to be found at the Mitsubishi Nagasaki Shipyard and the Yawata Iron and Steel Works are summarized as follows.

Prior to the founding of the Mitsubishi Technical School at the Mitsubishi Nagasaki Shipyard, there were two types of worker training: an informal type based upon individual instruction given by foremen and a formal type which was institutionalized according to the manufacturing plans of the shipyard. The formal worker training of the latter type has always been pointed out as one of the key factors in the formation process of the factory apprentice system in Japan. In 1890 the term "worker trainee" came to be used instead of "ap-

prentice," and in August 1899 various regulations regarding employment qualifications, employment procedures, and the period of apprenticeship of worker trainees were enacted. In June 1900 the apprentice worker system was established which consisted of two types of training: the worker training system for the training of mid-career technicians and the apprentice worker training for the young. In this initial stage, the training did not concentrate on the systematic training of the young leading to the accumulation of skills but on the worker training system which was aimed at enabling older workers to acquire skills in mid-career. Factory apprenticeship was conducted in a more rigid form by the implementation of the worker trainee system which was aimed at securing skilled workers with technical training and by the provision of clear regulations regarding the apprentice worker system for the young. The objective of the worker trainee system was not merely limited to workers employed in mid-career but also provided redevelopment opportunities in the subsequent process of actual work for workers who had completed their training as apprentice workers.

The Mitsubishi Technical Preparatory School (Mitsubishi Kōgyō Yōbi Gakkō), which was established in the Mitsubishi Nagasaki Shipyard in 1899, was administered by the worker trainee system and the apprentice worker system. Admission to this school was given to persons who were older than ten years of age and who had graduated from compulsory elementary school. The period of study at this school was for five years. Graduates of this school were treated as worker trainees at the Mitsubishi Shipyard, but their education continued and they were expected to attend the night course. The Mitsubishi Preparatory School not only provided a place for young apprentice workers to receive basic training but also provided an additional opportunity for them to develop their abilities.<sup>6</sup> Educational circles in the latter half of the Meiji period exhibited great interest in the skilled worker training system of this school. This school was evaluated highly in a report because it functioned as a special "educational institution" offering a curriculum equivalent to that found in public secondary schools. It also provided sufficient educational facilities for practical technical training.<sup>7</sup>

Another technical training system in a key industry was the Young Worker Training Center (Yōnen Shokkō Yōseijo) established at the state-run Yawata Iron and Steel Works. After the first firing ceremony was held in 1901, foremen invited from the Kamaishi Iron and Steel Works (the oldest iron and steel works in modern Japan) took charge of on-the-job training. After most of them had left Yawata in 1907, it

became urgent to create an organized technical training system. Thus as a preparatory measure to the second expansion of the iron and steel works, a managerial policy to establish a special technical training institution was made to secure skilled workers. The Young Worker Training Center was opened in 1910.

According to the documents which recorded the founding objectives of the Young Worker Training Center, two items were included: (1) to maintain a balance between academic knowledge and practical training; and (2) to emphasize practical training rather than theoretical education.<sup>8</sup> Applicants for this Center were sought among male students over 14 and less than 17 who had either graduated from upper elementary school or who were attending public secondary and public technical schools. The period of study was for three years. The curriculum was organized so that the first two years were spent primarily studying various academic subjects while the third year was devoted to practical training at the factory. Since the application guide stated that the students could become senior workers several years after graduation, many applicants from neighboring prefectures rushed to secure a place at this Training Center. There were some who even left secondary school in midcourse but only one out of ten applicants was admitted. The Center also offered workers a night continuation course as well as a regular course for workers who had graduated from upper elementary school. The continuation course consisted of a one-year program for regular workers and a six-month program for low-level superintendents. Thus, this Center accommodated both young and older workers with various accumulated experiences.<sup>9</sup>

There had been a previous system of in-company training prior to the establishment of the Mitsubishi Technical Preparatory School. However, the Young Worker Training Center was different because there had been no such labor management system. Nonetheless, both cases were similar in the sense that they provided long-term and full-scale in-company technical training systems in a period when the public secondary technical education system was insufficient. They also played a pioneering and substituting function vis-à-vis school education. Apart from the insufficient development of the public school system, other reasons can be cited for their role as a substituting function to school education as follows.

First, more favorable conditions for practical training were available in the system of in-company technical training. The Technical Training Center adjoined the production site and a significant proportion of the curriculum consisted of practical training. There was no lack of engineers and supervisors who were engaged in teaching and guidance.

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There was also a different technological environment inside and outside the enterprise. Since Japanese industrial technology at that time was largely dependent upon technology transfer from the Western countries, it was always possible to come in contact with the latest imported technology at leading industrial production sites. The new technology defined the kind of skills to be acquired, since the educational content in the system of skilled worker training had to be organized in response to the new technology. The Integrated Management Section for in-company training at Yawata Iron and Steel Works compiled standardized work manuals for each of the job types entailed in iron manufacturing and supplied them to the workers as major texts for skilled worker training.<sup>10</sup> Through the organization and reorganization of the curriculum which kept abreast with technological progress found inside and outside the enterprise, it was possible to expect optimum results from in-company skilled worker training.

The establishment of the above-mentioned pioneering technical training institutions greatly stimulated other enterprises in the same industry as well as those in other industries to establish or expand diversified in-company training systems. Five types of in-company training systems were implemented from the beginning of the twentieth century to about 1915: (1) systems which were institutionalized on the basis of the technical educational facilities and the technical training systems which had been in existence from the nineteenth century; (2) industrial training institutions which were newly established in the early twentieth century; (3) training systems which were primarily directed at continuing education and training; (4) training systems which were primarily directed at the apprentice training of technicians and at the education of children belonging to employees; and (5) a training course pursued outside of the company.<sup>11</sup> Of the above, (1) and (2) fall more or less in the same category because their in-company training is based on the date of establishment. However, for type (3), in-company education, which was developed around continuing education, was found typically among various companies in the spinning industry. Type (4) was found predominantly in the mining industry. Type (5) is a semipublic education system assisted by the Tokyo Municipal Industrial School (Cooperative Education Sector) to provide a one-year education at night to workers sent from large companies such as Shibaura Manufacturing, Ishikawajima Shipyard, and Tokyo Gas. The functions of the school education provided by these systems are summarized below.

In-company education and training carried out in the spinning industry and part of the mining industry had a complementary function



for employees who had not completed regular compulsory education; the in-company education provided them with a skill and also served as their formal education. For a long time, key worker training in the heavy industries continued to fulfill a substituting function for the system of in-company training. There were also enterprises in the mining industry which provided miners' children with a place for compulsory education. This can be called a supplementary function as it denoted social welfare work offered to the workers and their families who took up work at remote production sites. These functions are shown in Table 11.1. When the in-company training system is positively involved with the public system, its function becomes overt. This is because in-company training exhibits the same functions that schools expect it to fulfill. When in-company training is partially involved with school education, its adequacy is covert. In addition, when the system of in-company training itself is conclusive, and when the training plans are controllable in the enterprise, it can be seen explicitly that in-company training has been directly integrated. On the basis of adequacy and integration, it may be possible to categorize the functions of in-company training into four types and to distribute them accordingly.

Table 11.1 is patterned after the relationships between the functions of in-company training and school education. However, it is also possible to take a different viewpoint since in-company training and the maintenance and development of large organizations are mutually interdependent. Therefore, it may be helpful to consider the in-company training system as part of labor and personnel policies in a broad sense. Concerning the employment relationship between the company and its workers, in-company training was excluded within the framework of labor management policies. On the other hand, in response to the need of securing a labor force of a certain quality and quantity, the major objectives and the intent of training varied according to the total management policy. By combining these con-

		Adequacy	
		Covert	Overt
Integration	Indirect	Supplementary function	Affiliation function
	Direct	Complementary function	Substitution function

Table 11.1. The Positioning of Function

		Intention of training	
		Control oriented	Training oriented
Employment relationship	Indirect employment	1. Disciplinary control	2. Charitable training
	Direct employment	3. Supervisory control	4. Skilled worker training

Table 11.2. Intra-Organizational Function of In-Company Training

gruencies in Table 11.2, a pattern for the following four types emerges: (1) training accompanied with a disciplinary control system, (2) charitable training, (3) industrial training based upon a supervisory control system, and (4) training of skilled workers.

Types 1 and 2 are both based on an indirect employment relationship. The principal aim of Type 1 training is to prevent the workers from moving to other workplaces. When technical training is emphasized, it belongs to Type 2. Type 3 and 4 are both based on direct employment. When the principal aim of industrial training is to prevent interorganizational mobility, there is Type 3 which emphasizes supervisory control. Type 4 is formed when the aim is focused on technical training. In the mining industry, training is centered on Type 1 and Type 2. The function of the technical training system in the machine industry was equivalent to Type 3 in the early stage and the principal aim later shifted to Type 4. In the textile industry, in-company training belonged to either Type 2 or Type 3. What is the significance of such diversified forms of training? Companies invested in technical training and other forms of education and training because they thought that human development in a broad sense was indispensable for their growth. Enterprises' in-company training also fulfilled a substituting and complementary function to the public educational system. In relation to the background of that time when enterprises had to fulfill such functions, those who had access to educational and training opportunities were limited. Although the enrollment ratio in compulsory education around 1900 reached as high as 90%, the enrollment ratio among factory workers did not reach 50%. The ratio for workers in such light industries as textiles, matches, and printing was less than 30%. A few of the big businesses engaged in heavy industry were able to employ workers who had completed compulsory education and to train them at their training institutions. This was only applicable in a very small number of cases, and the majority of factories could not establish such facilities. As a result,

it can be said that among the above-mentioned four types, apprentice training accompanied by a disciplinary control system was dominant.

### III. Improvement of School Education and the Transformation of In-Company Education

#### 1. The Decline of Apprentice Schools and the Expansion of Technical Schools

The economy which had begun its rapid growth in the latter half of the nineteenth century increasingly solidified its foundation upon entering the twentieth century. World War I acted as the key factor for the rapid growth of industry, which saw a great change from 1910 to 1920. There was a great shift from light industries to heavy industries which promoted industrial development during this new stage, and the mass production system in big business emerged. Management organizations became progressively systematic and complex. The establishment of the labor management system, based upon direct employment in which enterprises concluded contracts with workers, materialized from the former labor relationship of indirect employment in which subcontracting foremen acted as intermediaries.<sup>12</sup> With such changes, because there was an increasingly greater demand for manpower (especially for machine operators) in the production process of heavy industries, there was a great need for skilled labor in these sectors. Skilled worker training became a concern of great importance for management. Both apprentice schools started in 1894 and technical schools started in 1899—the beginning of the public technical educational system—provided as much manpower as public secondary-level technical educational institutions. On entering the twentieth century, the demand for public technical schools became greater than that for public apprentice schools which had been established with the objective of modernizing the apprentice system.

Even though the number of technical school students was no more than five thousand around the time of the founding of such schools in 1900, the number of students increased remarkably and reached 20,000 in 1921 because the financial basis of technical schools was solidified through government subsidies. This increase was possible because through the abolition and merger of apprentice schools, secondary technical educational institutions were unified under the technical schools. Although technical school enrollment during the decade from 1925 had a slow growth rate, enrollment soared from 1935 when in-

dustry became more militarily oriented. Putting aside the growth in 1930s, the increase until the 1920s was due to an increase in educational opportunities supplied by the reform of the school system through the merger of apprentice schools and technical schools. A positive evaluation of technical schools gradually took root in industrial circles. Nevertheless, the relationships between both parties did not necessarily change smoothly because the industrialists had diversified opinions regarding the evaluation of the technical schools. In the 1930s a few industrialists harbored opinions that graduates of former apprentice schools were more suitable for practical work. Yet technical schools acquired a legitimate status in the total system of school education, and they were gradually evaluated more highly. At that time, secondary education was divided into the ordinary course, which admitted students who had finished the first half of a four-year compulsory ordinary elementary education, and the advanced course, for students who had finished an additional two-year upper elementary education. While the former was regarded as belonging to the subsidiary or affiliated line, the latter was regarded as the legitimate line or the mainstream. Technical schools succeeded apprentice schools and acquired a legitimate status. As a result of surveys, consultations, and discussions at the Nationwide Vocational Schools' Principals Conference in 1916 as well as by the Technical Education Study Committee established by the Ministry of Education in 1919, the distinction between technical and apprentice schools was abolished and they were unified into one category.<sup>13</sup> The unification implies that apprentice schools had achieved a certain level of acceptance as technical educational institutions.

## 2. The Lack of Technician Education and Training

The lack of a system in school education to train skilled workers was caused by the fact that apprentice schools which had not exhibited their intrinsic function sufficiently were changed institutionally into technical schools. It was natural that there was criticism regarding this state of affairs. The following was recorded as an example of the criticism regarding technical schools from the latter half of the 1930s:

Although some have maintained the tradition of apprentice schools after the change, and others call themselves worker schools or base their management on the idea of apprentice schools, the number as a whole is extremely small. Many uphold the abstract objective that they "provide necessary knowledge and technology to those people who intend to be engaged in industry." However,

who is meant by "those people who intend to be engaged in industry" is not ascertained.<sup>14</sup>

Moreover, the condition regarding the uncertain functions of technical schools was recorded as follows:

In the final analysis, they are extremely incomplete in their existence. Although many of the present technical schools give the appearance of technician training institutions, they are not so in reality and they fail in training workers necessary for actual industrial society.<sup>15</sup>

For their part, although some technical schools called themselves worker schools, many of them seemed to have aimed at the training of engineers and managers. As for the word "engineer," whether it denoted technicians or operatives or people merely engaged in practical skills was not clarified. The Labor Conciliation Board (Kyōchō-kai) established by the government to mediate labor disputes in 1919 thus expressed the following opinion:

In the contemporary industrial world, it is quite doubtful whether the graduates of technical schools can turn out to be the kind of engineers that the school wishes them to be or whether they have the possibility to become so. Therefore, it is noteworthy that many of the intellectuals and businessmen are of the opinion that contemporary technical schools should be made into training institutions for workers or foremen.<sup>16</sup>

Such criticisms emerged as a result of the lack of clear-cut objectives in the training of skilled workers after the merger of apprentice schools and technical schools from the 1920s. The criticism concerning technical schools expressed by the demand side rested on the fact that they lacked the function to train skilled workers. Nonetheless, the character of the technical school was subsequently clarified as having the function to train a technician class. Consequently, universities, higher professional technical schools, and secondary-level technical schools became training centers for high-level engineers, mid-level engineers, and low-level engineers.<sup>17</sup> These three levels of engineers did not exist in such a stratified form in the management of enterprises. The stratification should be called a hierarchical structure brought about by the school educational system. Another term used for low-level skilled workers was operators. Nevertheless, neither the position of the subengineers nor that of the operators was necessarily clear. Although the terms subengineer and operator were used to equate with the Western technician, there was neither a strict understanding of, nor a corresponding status for, the technician in the occupational structure. Despite the constant demand for a technician class even to the present, a

class of workers to fulfill this occupational function has not been clearly established. One of the reasons was the lack of technician training in school education and in-company training.<sup>18</sup>

### 3. The Transformation of In-Company Training

Together with an increased supply of workers from technical schools, enterprises came to incorporate workers into their labor management structure. In response to the circumstances that it was clearly difficult for the public educational system to supply skilled workers, enterprises ventured into the expansion of in-company skilled worker training. The institutionalization of the technical training system brought not only quantitative expansion but also qualitative transformation. The transformation content in the 1920s to the 1930s can be summarized as follows.

1. Industrial training: From the young to the mid-level worker. In addition to the industrial training of the young, the companies established a new system so that in-company training would be extended to workers with work experience. Depending upon the individual industry and company, there were cases in which the training of incumbent workers was given greater emphasis.

2. Industrial training to specialized industrial training: The young workers were initially exposed to a curriculum which consisted of basic technical training as well as general education. Together with the reorganization of in-company training for the work at the production site, the educational content became more specialized and particular. Repeated technological changes accelerated this tendency.

3. From off-the-job training to on-the-job training: The emphasis shifted to the training of techniques required at the workplace in accordance with the work process and away from educational training based on lectures.

4. From skilled worker training to supervisor training: Together with an increase in the number of skilled workers, a level of worker who controlled these skilled workers emerged as the production process became more complex due to technological progress. The implementation by companies of the so-called foreman system became urgent. There was also a need to reorganize the importance of in-company training for this purpose.<sup>19</sup>

The acquisition of skills and the problem of promotion is also related to the above-mentioned supervisor training. There was the formation of a job hierarchy based upon job performance and skilled workers were able to become supervisors dependent upon their job status and the responsibilities which their work entailed. The change of status

through promotion to a higher rank was accompanied by additional new duties. The way in-company training should be conducted was examined for each of these ranks.

#### 4. From Blue-Collar to White-Collar Workers

For many years, each company endeavored to train its skilled workers at the production site. In conjunction with technological development, however, the work performed by superintendents drew closer to that pursued by white-collar workers. Correspondingly, workers who performed highly skilled duties were given more sophisticated technological training. This technology was also reflected in the emergence of technology training in the training system.

The changes in the objective content and form of in-company skilled training which occurred in this period can be summed up by the above four points. The heavy industrial sectors centered on the machine industry also should be kept in mind regarding the trend pertaining to these changes. The process of these changes was directly applicable not only to the mining industry and small and medium enterprises. Moreover, the industrial training of white-collar engineers was limited to a portion of the industries and enterprises; even during the 1930s the group targeted for training was the blue-collar workers. The major factors which caused such changes to occur in in-company training were the aforementioned changes in public technical educational institutions as well as in the various enterprises themselves. Other factors were the policy decisions made by enterprises and governmental administrative guidance organs apart from schools and the industrial associations. Taking into consideration the various external conditions which influenced the transformation of in-company training, the technician training systems at the Mitsubishi Nagasaki Shipyard and the state-run Yawata Iron and Steel Works were transformed.

The Mitsubishi Technical Preparatory School prepared to accommodate a large number of students with the expansion of its school building because of a shipbuilding boom at the outbreak of World War I in 1914. In 1918, the school was renamed the Mitsubishi Technical School, supervised by the Mitsubishi Technical Education Foundation established in the same year. This foundation was established not only to cope with the skilled worker shortage but also to move toward the Mitsubishi Technical School being publicly authorized. Under the foundation's supervision, technical schools were founded at Mitsubishi enterprises other than the Nagasaki Shipyard. In 1919 the Mitsubishi Worker School was established at its Kobe Shipyard.

The Mitsubishi Technical School at the Nagasaki Shipyard which has a history of about twenty years, including a period as the Technical Preparatory School, was discontinued in 1913, and the Mitsubishi Worker School was newly established. At the same time, it was decided to discontinue the extended study system aimed at the graduates of the Mitsubishi Technical Preparatory School. This action was taken in response to the expansion of public secondary level technical education because the situation became such that the graduates of public educational institutions could nearly account for the number of low-level engineers needed by the industry. In conjunction with an increase in the number of orders received, the demand for skilled and semiskilled workers soared from 1915 to 1920 and the target was shifted to a short-term training of the semi-skilled workers.

It is noteworthy that the Mitsubishi Technical Preparatory School and the Mitsubishi Technical School had possessed a substituting function in technical school education and had reached the stage of complementing each other through their reorganization into the Mitsubishi Worker School. The era of the pioneering and substituting function ended in the first half of the 1920s.

In April 1926 the Youth Training Center Act (Seinen Kunren-jo Hō) was promulgated to pursue training centered on character building as well as military training. Due to special privileges given to those who completed the training in compulsory military service, many Mitsubishi Shipyard employees wished to be enrolled. The Mitsubishi Worker School of the Nagasaki Shipyard became an authorized private Youth Training Center in 1929. In accordance with the revision of the regulations regarding worker training in 1930, it became compulsory for Worker School students, trainee workers, and general minor operatives to be enrolled and attend the Youth Training Center. Immediately before the discontinuation of the Mitsubishi Technical School, the school had become large scaled and increasingly standardized. Upon receiving authorization as the Youth Training Center, the school provided not only in-company training but also spiritual training.<sup>20</sup> The Youth Training Centers provided education after the completion of compulsory education, and as will be explained later, they were closely related to the changes in the vocational continuation schools.

The second case pertains to the Young Worker Training Center of the Yawata Iron and Steel Works which underwent great organizational and functional changes from 1920 because of changes in the in-company training system and management reorganization. The changes derived from the reorganization of the Worker Training Center



(Shokkō Yōseijo) (1920) and the establishment of the Training Center (Kyōshūjo) (1927).

The Worker Training Center from 1920 was divided into courses consisting of the Apprentice Course (two years for the first part and two years for the second part), the Special Course for foremen, subchiefs (Go-chō), and general workers (a six-month night curriculum) and the Continuation Course (one year). Completion of upper elementary school was necessary for admission to the Apprentice Course which took the place of the traditional new employee training program at various companies. While the Special Course primarily aimed at supervisor training, the Continuation Course provided additional training opportunities to workers who had finished either the course at the former Worker Training Center or the Apprentice Course of the Worker Training Center. The reorganization of this Worker Training Center was based on the intention to provide scientific instruction at the job sites and to implement a policy that would reinforce the function of in-company training aimed at supervisors and incumbent employees.

In conjunction with the total reorganization of the in-company training system in 1927, the Iron Works Training Center was established. As a result, the system of apprentice training given to recruits outside the Iron Works by the Regular Course of the former Worker Training Center was rescinded. The policy concerning the promotion of basic skilled training for incumbent employees, the preparatory training of supervisors, and the competence redevelopment of supervisors was also clarified. The major reason for the discontinuation of in-company training given to boys who had finished compulsory education was due to the adverse reaction of the trainees at the Iron and Steel Works during the period of the Young Worker Training Center. When applications for admission to this center were being accepted from 1910 to 1920, the center advertized that its graduates could acquire the rank of white-collar senior worker within several years. Although many of the graduates from the center were so competent that they were promoted in a short period of time, they were not given the rank of senior technician in the employment structure. Since there was a personnel management policy to promote public technical school graduates to the rank of technical staff member soon after employment irrespective of competence displayed, there was growing dissatisfaction among the workers who had completed the course at the Worker Training Center. The labor disputes from 1918 to 1919 were triggered by this accumulated dissatisfaction.

When the labor dispute was settled, the Iron and Steel Works revised its labor management policies. The most noteworthy point of

this revision was that some of the operatives came to be treated equally with the technical staff members. The establishment of the Technician Training Center (Gijutsuin Yōsei-jo) was decided in 1919 as part of the above revision, and in 1928 the training was carried out in the advanced course of the Training Center. The admission requirements were either work experience or completion of secondary level schooling.<sup>21</sup>

The transformation in the in-company training systems of the Mitsubishi Nagasaki Shipyard and the Yawata Iron and Steel Works was due to the change in management control—in particular in the labor management policies of each enterprise—and the trend in the external environment which influenced management. The external environment reflected not only training policies but also industrial policies.

First, technical continuation schools which were one category of the vocational continuation schools developed gradually as a supplement to compulsory education. In contrast to other continuation schools, such as the commercial continuation schools and the agricultural continuation schools, the increase in the number of technical continuation schools was not pronounced. The Youth Training Centers also showed a quantitative expansion as additional institutions of technical education after compulsory education. The vocational continuation schools and the Youth Training Centers were merged and from 1935 became Youth Schools (Seinen Gakkō) based on the compulsory system.

Some enterprises began to incorporate regulations regarding Technical Continuation Schools and Youth Training Centers in their in-company training. The skilled training system which was placed under the control of the Mitsubishi Technical Education Foundation belonged to the type which incorporated formal school education.

In the course of the financial depression in Japan in 1927 and the subsequent Great Depression, the surge in the worldwide movement of industrial rationalization affected Japan. The Council for Industrial Rationalization (Sangyō Gōrika Shingikai) was established in 1929 and the Ad Hoc Industrial Research Committee of the Council in 1930; on the basis of their reports, the Ad Hoc Industrial Rationalization Bureau was established in the Ministry of Commerce and Industry in 1930. The Council and the Bureau took administrative leadership in the industrial rationalization. The Engineering Policy Association (Kōsei Kai), a joint group of government and civilian engineers, had founded the Technical Education Workshop Committee in 1925, and it suggested plans for improving technical continuing education.

Second, apart from the educational administration, the commercial and industrial administration as well as various managers' associations exerted influence as pressure groups for the improvement of Technical

Continuation Schools and for the founding of the Youth Training Centers. Through the establishment of various committees and workshops, administrative and managers' associations made influential proposals regarding the improvement of technical schools. One representative managers' association called the Japan Industrial Club (Nippon Kōgyō Club) founded in 1917 exhibited a very positive approach to surveying and researching labor problems. It expressed views regarding the way technical education should be and submitted a proposition to the Ministry of Education concerning the establishment of educational institutions for worker training. The survey and research were entrusted to the Labor Conciliation Association (Kyōchō Kai). In the process of the industrial rationalization movement, this Association maintained many close contacts with other associations, councils, workshops, and the Ad Hoc Industrial Rationalization Bureau and greatly contributed to the improvement of worker training.

#### IV. Small and Medium Enterprises

In the first half of the twentieth century, when the rapid growth period of the Japanese heavy industries was almost completed, a dual structure was formed as a result of the imbalance between big businesses and small and medium enterprises. The dual structure caused a gap in the implementation of the in-company training system. What was the effect on the small and medium enterprises which could not afford to establish a structured training system for creating skilled labor? How were they able to secure skilled workers?

To answer these questions, assuming that skilled worker training emphasized on-the-job training, the process of acquiring skills by itinerant workers or independent artisans in the open and fluid labor market and the methods of securing skilled workers will be examined in several cases. Although not related to small and medium enterprises, the actual conditions regarding the method of skilled labor procurement at a heavy industrial factory run by big business in a peripheral location will also be mentioned. The influence exerted by industrial reform from 1910 onwards upon the industrial training of small and medium enterprises should also be kept in mind. Analysis will center on the stipulations of the Factory Act and the impact of the industrial rationalization movement.

##### 1. The Establishment of the Factory Act and Apprentice Training

The Factory Act was approved in March 1911 at the Twenty-seventh Imperial Diet Meeting. Prior to its enactment (September 1916), the

Enforcement Ordinance including the regulations for apprentices was drafted. During this process, two conflicting opinions arose: one group held that apprentice legislation was unnecessary and another group held that apprentice legislation was necessary. The former group took this view because it felt that few factory owners offered training to apprentices, trainees, and indentured apprentices. The latter group stated that a system of technology transfer already had been established through a give-and-take apprentice relationship between master and apprentice. After discussing the issue, the group supporting the necessity of apprentice legislation became dominant, as it insisted on the implementation of a training system to develop the apprenticeship system, which was based upon traditional paternalism. This group also believed in the separate treatment of apprentices from workers. It was decided, therefore, to create independent regulations regarding apprentices. To be designated an apprentice in accordance with the Factory Act, the regulations contained rules pertaining to the "training" given to apprentices.<sup>22</sup>

According to A Chronological Bulletin by the Office of Factory Control (Kōjō Kantoku-kan Nempō) for the years 1917 to 1933, only 23 factories accommodated apprentices in 1923 and in 1921 there were 3,310 apprentices. Apart from the negative attitude exhibited by employers toward the Factory Act, this situation was caused by a steady decline of the apprenticeship system as well as by the development of other methods and systems for the training of skilled workers. Although the number of apprentices per factory immediately after the enforcement of the Factory Act was as many as one hundred and forty in 1917, the number subsequently declined. The decreased number of apprentices per factory when the factory size was expanding due to the growth of enterprises denotes that the Enforcement Ordinance of the Factory Act was made applicable to relatively small factories and indicates that the foundation for the expansion of training opportunities for workers in small and medium enterprises was gradually being laid. Nevertheless, the small and medium enterprises that were authorized by the Enforcement Ordinance of the Factory Act were very few. The majority of young boys and men working there spent their careers in unstable employment conditions without having the opportunity to receive systematic training.

## 2. Itinerant Workers and the Formation of Skills

Systematic training at small and medium enterprises was stagnant. To examine how these enterprises acquired skilled labor, it is necessary to touch upon two points: first, skilled workers were mobile; second,

in-company training was given in peripheral localities and industries. The most important factor concerning worker mobility was the existence of "itinerant workers." *Bōseki shokkō jijō* [Circumstances of Spinning Operatives] reported that due to the existence of itinerant workers few workers stayed at the same spinning factory for more than two or three years.<sup>23</sup> When there was such a low settlement rate of labor, itinerant workers played an important role in the employment pattern of big enterprises. The rank-and-file, including junior foremen who played a leading role in the labor disputes of 1906 to 1907, took a rebellious position against the administrators and senior foremen in the workplace.<sup>24</sup> Manual techniques acquired by the skilled workers were obtained through "mimicking" and "stealing the master's skills." A similar situation existed in big businesses as well as in small and medium enterprises. As a result, during one of the boom periods there was the formation of a heavy industrial labor market which "induced the mobility of workers right through large to small and medium enterprises and enclosed both large enterprise workers and small and medium enterprise workers into one labor market."<sup>25</sup> Excluding the sectors which did not require skilled labor, workers in heavy industries could become mobile as itinerant workers. This condition had been in existence since before the industrial rapid growth period,<sup>26</sup> and it was the dream of skilled workers with ample experience either to obtain positions as foremen at newly established enterprises or to make an "independent move" by becoming small business owners.

The circumstances changed drastically around the turn of the century. Although skilled workers at large enterprises worked hard every day with the hope either of being promoted to foremen in the same organization or of becoming business owners of small downtown factories, their possibilities for starting small factories decreased distinctly from about that time. Apprentices with little experience and workers who had not acquired sufficient skills could neither become independent as small business owners nor be promoted to foremen. Many workers turned "itinerant" and kept moving from one small factory to another. The mobility of itinerant workers became possible due to labor disputes and the economic boom caused by World War I. Later, however, itinerant workers lost their stepping stones to independence and success. This tendency became more pronounced in the latter half of the 1920s. Having improved their skills at other enterprises, apprentices returned to the enterprise that had given them initial training by their boss, and itinerant workers who did not settle down moved to factories that paid higher wages but were not given positions of responsibility. Even in the case of mobility within

the same organization, the career of workers who had started as apprentices differed from that of itinerant workers. The workers of apprentice background did not move from factory to factory to increase their wages but did so to improve their skills. They ultimately became independent and managed factories.

Three characteristics of itinerant workers can be pointed out. First, a prerequisite to success in the form of independence was competence and outstanding ability. It was necessary to receive basic training during the period of apprenticeship. Second, even after independence, one was unlikely to be successful if one lacked managerial experience and had a poor relationship with one's clients. Third, an affiliation with the initial owner helped toward independence.

### 3. The Procurement and Training of Workers in the Periphery

Many of the in-company training organizations which were institutionalized in the early stage pertained to large urban enterprises in the heavy industrial sector.<sup>27</sup> Because small and medium enterprises could not afford to establish their own in-company training systems, many workers tried to learn skills by either copying and stealing the skills of senior workers or by improving their techniques as itinerant workers. Until the latter part of the nineteenth century, when the labor market was in such flux that it contained workers from both large enterprises and small and medium enterprises, technology and skills were transferred together with the mobility of workers. Factory managers in the industrial belt areas and in the peripheral areas from cities had to resort to in-company training as a means to acquire and accumulate skills in their factories. The accumulation of skilled workers was generally insufficient in peripheral industries because they were either latecomers or declining. Regarding the kind of training facilities implemented upon entering the twentieth century, the Kamaishi Iron and Steel Works is an example of a factory in a peripheral locality. The Works was the oldest iron mill in Japan and boasted a tradition of pig iron production with the use of endogenous technology prior to Japan's industrialization. It was a company based on large-scale management. Due to its geographical isolation from the metropolis, the management devised various ways, outlined below, to secure and train workers.<sup>28</sup>

First, an ordinary elementary school was established in 1900 and detailed regulations for the discipline of children were stipulated regarding children's clothing, manners, language, and even eating and drinking habits. This school was managed with funds from the Iron and Steel Works; the pupils were the children of people who had partic-

ularly close ties with the iron works. Given an educational administration which endeavored to extend public education, the authorities must have greatly welcomed the privately established ordinary elementary school. Through the establishment of this ordinary elementary school, the enterprise not only expected the incumbent workers to settle down but also it hoped to secure a stable labor supply in the following generation. The aim of this school was to offer a regular education to the children of the iron and steel workers. According to the type of in-company training discussed earlier, this school fulfilled a supplementary function.

The Youth Training Center (Seinen Kunrenjo) was established in 1927. The center, in accordance with government regulations, provided a four-year training program in the regular course and the vocational course, both of which were based upon intensive curricula. The education offered was such that it was considered to be the model youth training center of the entire prefecture, and the educational content was as good as that given by a secondary level technical school at that time. Subsequently, due to a legal change, the Youth Training Center became the Youth School (Seinen Gakkō) in 1935. In 1939 the Technical Training Center was started in accordance with the In-Factory and In-Company Technical Training Act (*Kōjō Jigyōjō Yōsei Rei*), and further emphasis was placed on technical training. The Technical Training Center provided an education which was more specialized than that offered by the Youth School. New students were selected on the basis of competitive examinations.

In-company training was more structured in the 1930s when the Youth Training Center was changed to the Youth School in accordance with a legal stipulation and when the Technical Training Center was established. The procurement and training of a senior labor force before that time was pursued in a more informal way. The procurement of a young labor force depended on connections made through the relatives of friends belonging to the employees of the Kamaishi Iron and Steel Works. Many mid-level and senior members of the labor force were also employed on the basis of connections. There were some workers who, prior to entering Kamaishi, had worked either in town factories or had experienced careers in military arsenals. There were others who had traveled 600 kilometers away to factories in Tokyo and its outskirts where they had experienced a skill-mastering tour similar to the "knight-errantry" (*musha shugyō*) of old. The process of skill acquisition there centered on on-the-job training which was given by a supervisor called the "boss" (*oyakata*) who was directly responsible for the workplace. The training was the same as that in a town factory,

and workers mimicked the boss and "stole" technical know-how possessed by him. At the same time, the boss maintained a paternal relationship with his subordinates. The procurement and training of a labor force even at a large factory was based on informal relations in each work unit, and the factory employed workers who had mastered skills in other regions and factories as was done by itinerant workers.

The above case pertains to a factory in a peripheral geographical location. An example from mining, therefore, is appropriate to show the situation in a peripheral industrial sector. In this industry, the "bunkhouse system" (*naya seido*) was in existence for a long time even at big businesses, and the "boss" exerted immense power over the mine workers. These bosses who had titles such as job-site foreman or bunkhouse foreman had functions which changed depending on the period. In the early stage, the boss had the role of gathering manpower and was called a "sub-contractor to recruit mine workers." In addition to the function of securing manpower, the foreman had to encourage the recruits to go into the mine. He also supervised and managed the work, paying special attention to the prevention of escape on the part of the mine workers. The foremen suppressed, abused, and exploited sub-contracted workers with the use of the following methods: forced savings, in which a portion of the wages was put aside from the beginning; payment-in-kind, in which a portion of the wages was given in kind; supply-of-goods, in which living essentials were supplied; discipline, in which the foremen imposed sanctions on the offending worker for insubordination and breakage of machines and tools. These methods and regulations were the prototype of the foreman system which led to the emergence of a welfare type of labor management.

This prototype began to change from about 1910, triggered by uprisings of mine workers who demanded the expulsion of the foremen as well as the abolition of the foreman system. From 1920 onwards, the management partially revised the foreman system. The prototype of the foreman system was dissolved and in its stead the "coordinator system" was created. The "amicable association" also was established as a mutual relief organization for the mine workers. Nevertheless, the foreman system continued. Although industrial training at the mines outgrew the system based on disciplinary control, conventional apprentice training remained and training received by these apprentices was based on the supervisory control system (see Table 11.2).

#### 4. The Response to Industrial Rationalization

The Kurihara Factory (presently the Daido Wool Company) serves as an example of industrial rationalization's impact on educational



training in small and medium enterprises.<sup>29</sup> Around 1930 when the industrial rationalization movement began, the Kurihara Factory changed its production emphasis from muslin to woolen yarn. During the period of muslin production, skilled maintenance mechanics had been the main workers in charge of the production site. However, when new employees entered the firm as a result of the establishment of the retirement system in 1932, applicants were recruited through village and town heads as well as from elementary schools in order to secure and train high quality female workers. All new recruits were educated at the Kurihara Diligence School (Kurihara Kin'ai Gakkō) founded in 1932. This school consisted of four courses: the regular course for female workers who had completed ordinary elementary school or its equivalent; the seminar course for female workers with a schooling beyond upper elementary school; the special course, which did not specify any educational background; and the preparatory course for those who did not have the equivalent of an ordinary elementary school education.

In 1934 this school was renamed the Kurihara Diligence Girls' School and it became a five-year vocational girls' school which was formally authorized as a secondary educational institution. When the Youth School became compulsory in 1939, the educational content was improved in accordance with the Youth School Act. The Kurihara Diligence Girls' School had as many as five hundred students by 1939 and including big businesses it was one of the few factory controlled educational establishments at that time.

The response of the Kurihara Factory to the industrial rationalization movement was not limited to in-company education and training. Management was reformed and the newly created engineering section made technological improvements. Many other new attempts were made such as the quality survey of raw materials, product testing, the establishment of a safety committee, a waste elimination committee and motion and time study. As of the latter 1920s, small and medium companies which had begun management rationalization were rare. In-company education also comprised a part of rationalization in business and labor management.

## V. The Diffusion of In-Company Training

In the period from about 1900 to 1930, in-company education and training in Japan was influenced by various environmental changes. First, not only the function of in-company training vis-à-vis public school education but also its status in the enterprise was transformed.

This transformation process should be examined in accordance with Table 11.1. Second, it is necessary to discuss the background which brought about such a transformation in in-company training. Because these two points are related to a wide range of areas, this section will be limited to in-company training and the administrative integration of vocational training.

### 1. Standardized In-Company Training

Of the two major heavy industrial companies which played a pioneering role in systematic training, Mitsubishi Nagasaki Shipyard was changed from a technical school to a large-scale worker school. The Youth Training Center was renamed the Youth School due to a change in the system. At the Yawata Iron and Steel Works, however, the pioneering function of the Young Worker Training Center for boys declined gradually. Instead there were increased opportunities for workers and supervisors to receive additional training.

The training systems in these heavy industrial sectors led the way in secondary level technical education. Although they pursued a substituting function in the early stage, their educational content was gradually standardized to accommodate a large number of students after the reorganization of their training systems into worker schools. During the stage when they were being changed to the Youth Training Center and the Youth School, greater emphasis was increasingly placed on compulsory postprimary education and training. During this process, the substituting function vis-à-vis school education which had been seen in the initial stage disappeared and a complementary function was emphasized. In the stage when Mitsubishi's in-company training system was authorized to become the Youth Training Center and when the compulsory Youth School functioned stably within the industrial organization, the training given acted in concert with and adapted itself to postprimary education.

The textile industry and the mining industry which were latecomers in the systematization of in-company training exhibited almost similar conditions. Although there was no establishment of a training system with a substituting function in these industries, they founded technical training institutions in parallel with facilities which fulfilled other functions. In the textile industry, institutions for male operatives to be trained in spinning technology as well as to be supervisors were established later than the founding of liberal and arts education (*gigei kyōiku*) with a complementary function for female operatives. In the mining industry, the mining school was opened and an education for miners' children as a supplementary function was provided.

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This trend was seen largely from the twentieth century onwards and thus it was not a part of the pioneering attempts made in the heavy industries centering on the machine and the iron and steel industries. From the 1920s, when technical training spread to various enterprises, these industries—particularly major enterprises such as coal mining—established technical training institutions. According to a survey conducted by the Industrial Welfare Association (Sangyō Fukuri Kyōkai), the rate of establishment of technical educational facilities among coal mining companies was the highest in 1932. In the reorganization process into the Youth Training Center and the Youth School, these facilities acted in concert with public postprimary education. It was during this stage that a standardized training and also mental training became the significant objectives of industrial training.

### 2. Governmental Labor Control

Much of heavy industries from the 1930s was under the control of the military. With the expansion of armaments, industry reached the stage in which even heavy industries in the private sector switched to munition production. Government policy enforced a nationwide state control over new recruits as well as the transfer and training of workers which had thus far been pursued independently by private enterprises. Since the government had already experienced state involvement in the training of skilled workers during the industrial rationalization movement in the 1920s, there existed a foundation on which to build a cooperative system between the government and business. It was also possible to deal with various procedures beyond the framework of educational administration for the training of skilled labor. In-company training at this stage did not function in accordance with the school system but was related to the nationwide labor market.

The most salient law regarding the state control of the labor force was the National Mobilization Law (Kokka Sōdōin Hō) promulgated in 1938 and other related acts such as the Labor Recruitment Limitation Act (Jūgyōin Yatoiire Seigen Rei), Factory Production Site Technical Training Act (Kōjō Jūgyōjo Ginō Yōsei Rei), and the Enforcement of Compulsory Youth Schooling (Seinen Gakkō no Gimuka). State control of the labor force was pursued through an intricate network which consisted of Labor Adjustment Act (Rōmu Chōsei Rei), National Labor Service Cooperation Act (Kokumin Kinrō Hōkoku Kyōryoku Rei), National Occupational Ability Declaration Act (Kokumin Shokugyō Nōryoku Shinkoku Rei), Employees' Recruitment Placement Order (Jūgyōin no Yatoiire oyobi Shūshoku Meirei), and others. As for the background to the establishment of

these laws, attention had to be paid to a chronic shortage of skilled workers.

From the 1920s, there had been a continuous shortage of skilled workers. However, the circumstances became so severe from about 1930 that enterprises scrambled for skilled workers from other enterprises. Various measures were devised to solve this problem. A controversy arose regarding the type of training to be given skilled workers, namely, whether workers were to be multi-skilled or single-skilled. The viewpoint that stressed the need for multi-skilled senior workers who could pursue a task independently with a comprehensive knowledge of various types of work was in conflict with the other opinion that insisted on the early training of single-skilled workers (also called expert or specialized workers) who mastered piece-meal tasks under the guidance of foremen. The Apprentice Problem Study Group of the Kyōchō Kai and the Ministry of Education took the former stance while managers and business leaders supported the latter. Although no conclusion was drawn from the controversy, it had great impact on industrial training and technical education.

The opportunities for small and medium enterprise workers who had been kept beyond the bounds of education and training were expanded as a result of the reinforcement of control over the labor force and the labor market on a nationwide scale. The Subcontract Youth Schools (*shitauke seinen gakkō*) and the Joint Schools (*kyōdō gakkō*), which were established in accordance with the enactment of the 1939 Youth Schools Act, were representative examples of such increased opportunities for education and training. New organs were created and the existing educational training organs were improved at all enterprises ranging from big businesses to small businesses. The concerned ministries and bureaus also became involved with technical training systems. Mechanic training centers, for example, came to be controlled by the Ministry of Commerce and Industry. Vocational Guidance Centers (*Shokugyō Hodō-jo*) were newly established, and unemployment matters which had been pursued by employment placement centers (*shokugyō shōkaijo*) were placed under the administration of the Labor Bureau of the Ministry of the Interior. These centers as well as other industrial training institutions such as various vocational schools, factory schools and joint schools all endeavored to establish concrete systems offering extensive technical training.<sup>30</sup>

Although in-company training spread more widely in the 1930s when employment training, transfer prevention, and the effective utility of workers were more structured and planned, uniquely characterized systems of industrial training decreased. Institutionalized industrial

training oriented toward the training of a large number of skilled workers became dominant. As a result, the structure of the industrial training systems was changed so that their functions were related to a wider range of areas than those found in public school education.

### Notes

1. Ministry of Education, *Nippon no seichō to kyōiku* [Japan's Growth and Education] (1963).
2. Regarding the history of graduate engineers, refer to Iwauchi Ryōichi, "Kindai Nihon ni okeru gijutsusha no keisei" [Formation of Engineers in Modern Japan] in *Keiei Shigaku* [Business History Review], vol. 7, no. 3 (1973), pp. 32–63, and "Institutionalizing Technical Manpower Formation in Meiji Japan," *The Developing Economies*, XV-4 (1977), pp. 420–39.
3. Tokyo Institute of Technology, *Tokyo Kōgyō Daigaku 60 nen shi* [A 60-Year History of the Tokyo Institute of Technology] (1940).
4. There was an attempt to put forth various functions by Iwauchi Ryōichi's "Nippon no kōgyōka ni okeru gijutsu kyōiku no yakuwari" [The Role of Technical Education in Japan's Industrialization] in Ishitoya Tetsuo, ed., *Hendō suru shakai no kyōiku* [Education in a Changing Society], Daiichi Hōki Shuppan (1977), pp. 246–65.
5. They provided off-the-job training as well as on-the-job training on specific imported technology at more than five bureaus.
6. From Mitsubishi Nagasaki Shipyard, Worker Section, *Nagasaki Zōsenjo rōmushi* [A History of Labor Affairs at the Nagasaki Shipyard], vol. 2 (1928), pp. 40–55.
7. Makino Keizō, "Nagasaki Mitsubishi Zōsenjoritsu Mitsubishi Kōgyō Yobi Gakkō no jōkyō" [Conditions of the Mitsubishi Technical Preparatory School Run by the Nagasaki Mitsubishi Shipyard], *Kyōiku Kōhō* [Educational Public Bulletin], no. 308 (15 June 1906), p. 41.
8. Saegusa Hiroto, Iida Ken'ichi, *Nippon kindai seitetsu gijutsu hattatsu-shi* [A Developmental History of Modern Japanese Iron and Steel Manufacturing Technology], Tōyō Keizai Shinpō-sha (1957), pp. 644–51.
9. For a detailed analysis of the training system in Nagasaki and Yawata see Iwauchi Ryōichi, "Industrial Training in Japan, 1890–1930 (1) and (2)," in *Bulletin of the Tokyo Institute of Technology*, no. 110 (1972), pp. 41–49; and no. 114 (1973), pp. 63–86.
10. This was completed through a compilation of work manuals which corresponded to the jobs entailed in iron and steel manufacturing.
11. Labor Management Data Compilation Committee, ed., *Nippon rōmu kanri nen shi* [Japanese Labor Management Chronological Bulletin], vol. 1, book II, *Nippon Rōmu Kanri Nenshi Kankōkai* (1964), section I, p. 164.
12. Hazama Hiroshi, *Nippon rōmu kanrishi kenkyū* [Studies of Japanese Labor Management History], Diamond-sha (1964).
13. For more details, refer to *Zenkoku jitsugyō gakkōchō kaigiroku* [Minutes of the Nationwide Vocational Schools Principals' Conference] (1917), compiled by the Vocational Schools Bureau of the Ministry of Education.
14. Kyōchō-kai, *Totei seido to gijutsu kyōiku* [The Apprentice System and Technical Education] (1936), pp. 283–84.
15. *Ibid.*, p. 284.
16. *Ibid.*
17. There was also a notion that with the inclusion of other schools, there existed five levels. In contrast to this, the later director of Rikagaku Kenkyūjo (Research Institute of Science and Chemistry), Ōkōchi Masatoshi, presented critical views

and discussed the way technical schools should be in *Kōgyō kyōiku iken* [Opinions on Technical Education], Kagaku Kōgyōsha, 1918.

18. This was also deeply related to a delay in the training of foremen. Regarding the ambiguous character of foremen at that time, refer to Kyōchō-kai, *Shokuchō oyobi shokuchō shidōsha no kyōiku* [Education of Foremen and Foremen Leaders], 1932, pp. 157–66.

19. The actual conditions are described in Kyōchō-kai, *Shokuchō oyobi shokuchō shidōsha no kyōiku*, Section 3, Chapter 2.

20. Mitsubishi Head Office, General Affairs Department, Survey section, *Rōdōsha toriatsukai ni kansuru chōsa hōkokusho* [A Survey Report on the Handling of Workers] Section I, Vol. 1 (1914), Zaidan Hōjin Mitsubishi Kōgyōkai, *Mitsubishi Kōgyō Gakkō ichiran* [Mitsubishi Technical School Bulletin] (1922), Mitsubishi Heavy Industries Co. Ltd., Company History Compilation Office, *Mitsubishi Jūkōgyō Kabushiki Kaisha shi* [A History of Mitsubishi Heavy Industries Co. Ltd.] (1926), Mitsubishi Nagasaki Shipyard, Operative Section, *Nagasaki Zōsenjo rōmu-shi* [A Labor History of the Nagasaki Shipyard] (1928), Zaidan Hōjin Mitsubishi Kōgyō Kai, *Shiritsu Mitsubishi Nagasaki Kōgyō Gakkō kiteishū* [A Compilation of Regulations for the Private Mitsubishi Nagasaki Technical School] (1941).

21. See the Iron Steel Works public relations magazine, *Kurogane* [Iron], each number from 1919 to 1925; Saegusa Hiroto, Iida Ken'ichi, *Nippon kindai seitetsu gijutsu hattatsu-shi*, 1957; Fujita Wakao, *Nippon rōdō kyōyaku ron* [Studies on Japanese Labor Agreement], University of Tokyo Press; 1961; Yoshimura Akira, "Kan'ei Yawata Seitetsu ni okeru ginō yōsei no tenkai katei" [The Development Process of Technical Training at the State-Run Yawata Iron Works] in *Shokugyō kunren* [Vocational Training], vol. 12, no. 10, October 1970; Nippon Steel Corporation, Yawata Iron and Steel Works Education Section, "Yawata Seitetsujo kyōiku nen shi" [An Educational History of Yawata Iron and Steel Works] (mss), 1970.

22. According to the Factory Act, the Enforcement Ordinance Article 28 (Conditions of Apprentice Employment) and Article 29 (Application Items Regarding the Request for Apprentice Employment to be Authorized by the Head of the Local Autonomy).

23. Ministry of Agriculture and Commerce, *Bōseki shokkō jijō* [Circumstances of Spinning Operatives] (1900). Incidentally, at that time, 49% of male operatives and 47% of female operatives had less than one year of service at the spinning mills.

24. Hyōdō Tsutomu, *Nippon ni okeru rōshi kankei no tenkai* [The Development of Labor and Management Relations in Japan], University of Tokyo Press (1971), p. 264.

25. *Ibid.*, p. 130.

26. Sumiya Mikio, *Nippon chinrōdō-shi ron* [Studies on Japanese Wage Labor History], University of Tokyo Press (1959).

27. Seike Kiyoshi, *Sangyōjin no kōteki rensei* [Artisan Training of Industrial Workers], Nippon Kōgyō Kyōiku Kyōkai (1942), p. 79.

28. From Nippon Steel Corporation, Kamaishi Iron and Steel Works, Ability Development Section, Study Center Alumni Association, *46 nen no ayumi* [A History of 46 Years] (1970), pp. 12–28, and *Shiritsu Kamaishi Kōzan jinjō Shōgakkō* [The Private Kamaishi Mine Ordinary Elementary School], nd.

29. Oyamada Eiichi, "Chūshō kigyō ni okeru sangyō kunren" [Industrial Training at Small and Medium Enterprises], Nippon Sangyō Kunren Kyōkai, ed., *Sangyō kunren 100 nen shi* [A 100-Year History of Industrial Training], Sangyō Kunren Kyōkai (1971), pp. 513–41.

30. Awaji Enjirō, *Shokkō Yōsei* [Worker Training], Chikuma Shobō (1940), pp. 33–62.