

# **Building of Human Resources and the Introduction of Technology**

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The purpose of this article is to shed light on the continuity and discontinuity of the colonial period into the 1960s by analyzing the process of building human resources and the introduction of technology in the 1950s.

Korea's economy went through turbulent times immediately after liberation. However, the Korean government and the U.S. Military Government in Korea prepared a relatively systematic training program to fill the technical void. This training policy that provided technicians and skilled laborers was begun under a directive of the U.S. Military Government Office, but Koreans who had accumulated technical and administrative abilities during the colonial period led the effort.

This systematic policy entailed: 1) sending people abroad in order to cultivate highly skilled technicians; 2) implementing license examinations to verify diverse skills learned from various regions; and 3) short-term training in order to secure a stable supply of skilled laborers. The U.S. Military Government Office reconfigured school education, resulting in a rapid expansion in the number of science and engineering students who graduated starting in the mid-1950s. Raw materials and partially finished products increased until the mid-1950s and played an important role in industrial rebuilding.

In conclusion, this paper sheds light on the introduction of technology since the mid-1950s in preparation for full-scale industrialization in the 1960s. The establishment of human resources and the introduction of technology can be considered a legacy of colonial days in terms of the system and main manager, but it was also a process of creating a new Koreanized system of supplying human resources via vocational education, dispatch of highly skilled technicians, and the introduction of technology.

Keywords: human resources, introduction of technology, system of training skilled laborers, school educational system

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## I. Introduction

The purpose of this article is to shed light on the continuity and discontinuity of the colonial period into the 1960s by analyzing the establishment of human resources and the introduction of technology in the 1950s. In general, the Korean economy is said to have started to grow in earnest in the 1960s, but we cannot say that there is enough research on the recovery process of the technical void<sup>1</sup> in the 1950s that made the economic growth of the 1960s possible. Hence the analysis of the actual conditions of the recovery process through the establishment of human resources and the introduction of technology is the primary task of this paper. Moreover, the impact of building human resources and the introduction of technology on economic development during this period will also be examined.

Unlike the dazzling economic growth in the 1960s, building human resources in Korea occurred after liberation and in the 1950s under very weak conditions. Taiwan and North Korea as the colonized and Japan as the colonizing imperial nation were in similar repetitively chaotic situations after the end of the war, but they went through different situations in building human resources. In a short period of time, Japan secured 4.2 million highly skilled resources in the form of returnees, including Japanese technicians from its colonies, which is equivalent to 12% of its domestic labor force, and they were streamlined mainly into the non-agricultural labor market (Odaka 1996). Taiwan filled the void in human resources left by the large number of Japanese technicians returning to their homeland through restructuring its organizations in the form of promoting technology education, hiring mainland Chinese who had experience in running companies as executives and managers, and promoting Taiwanese managers who had on-the-job experience as superintendents (Minato 2005). North Korea, on the other hand, expanded its human resources by detaining Japanese technicians to alter fuel engine to make natural fuel and by putting them in charge of technology education (Morita and Nagata 1980). The condition of human resources in South Korea was at a considerable disadvantage in comparison to its neighbors. South Korea was in a position to concentrate more on overhauling

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1. *Joseon gisulga myeongbu* (List of Names of Joseon Technicians) is the most reliable source on the condition of colonial technicians and contains a complete list of technicians from 1939 who graduated from at least vocational school. The total number of technicians was 6,775, among whom 5,720 or 84.4% were Japanese (Kim 1996:132).

its system of training skilled laborers and the school educational system. In other words, there was a shortage of capital for introducing equipment and technology during this period; the situation was such that it was imperative to find not only supervisors to run factories but technicians and supervisors of production sites to select the facility equipment and technology to be imported (Uchida 1990:272). The introduction of technology could be achieved through full-scale aid after the mid-1950s because the system for building human resources was constructed immediately after liberation.

The goal of this paper is to reveal how the system of training skilled laborers and the school educational system, which made the introduction of technology possible, were established and restructured immediately after liberation and in the 1950s. Moreover, this paper will show how the introduction of technology proceeded in the process of introducing aid, which greatly influenced the economic growth of the 1960s.<sup>2</sup>

After liberation, the building of human resources and the introduction of technology for recovery from the technical void proceeded on three dimensions: First, skilled laborers received short-term training and were subject to license examinations; second, technicians were trained at domestic and overseas educational institutions along with a license examination system; and third, technology was introduced with the help of aid. Immediately after liberation, efforts were concentrated on training skilled laborers in a short time because it was impossible to educate technicians in the short-term. The educational institutions emphasized restructuring in order to prepare for long-term training of technicians, and the result of this began to appear from the mid-1950s. Training of a few highly skilled technicians was achieved by sending them overseas, and that became a large-scale project beginning in the mid-1950s when aid was introduced in earnest.<sup>3</sup> In particular, the training of human resources faced a new situation during the implementation of aid while introducing equipment along with training technicians who could operate the equipment.

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2. This research has found important implication from Seo Mun-seok (2004) who reached a three-dimensional conclusion on colonial legacy by analyzing the spinning industry, including companies operated by Joseon people. There was a disruption of the few technicians during the colonial period and the continuation of relatively many technicians, thus providing balanced views that contrast with the previous one-sided research.

3. Refer to Seo Mun-seok (2004) for detailed information on the situation of highly skilled technicians immediately after liberation.

Therefore, this paper will focus on the building of human resources in the latter half of the 1940s and the introduction of technology after the mid-1950s. The final result will be examined through an indirect index of trend in invention and device patents.

## II. Training Policy and School Education

### 1. Training Policy and Actual Conditions

#### 1) Main Policy and Main Manager

The technical training policy was implemented by the U.S. Military Government Office immediately after liberation, and those who actually oversaw the policy were Koreans.

Clause 2 of the “Directive of the Bureau of Mining and Manufacturing of the U.S. Military Government Office” established the “Committee on Technology Education” on December 29, 1945, under the direction of the U.S. Military Government Office to “dispatch students to study abroad in America and train apprentices domestically” (Dept. of Commerce 1946). The Committee consisted of a chairman, two directors, and three committee members including Yi Tae-Gyu, the dean of the College of Liberal Arts and Science, Seoul National University. Chairman Oh Jeong-su held the post of chair due to his qualification as head of the Department of Commerce; Director Bak Dong-gil held the post of director through his qualification as the chancellor of the Geological Mining Laboratory, one of two research centers on national policies at the time; and Director Ahn Dong-hyeok was the most active of the committee members.<sup>4</sup> He wrote the rough drafts of “Regulation of the Association for the Advancement of Government-Acknowledged Industrial Technology Education,” “License Examination for Industrial Technicians,” and “A Guide to Training Experienced Technicians” as well as being proactive in publicizing about the training of technicians (Ahn 1946).

Important matters related to the technical training policy were discussed and decided on by the Committee after liberation, among them the rough draft on

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4. For a more detailed resume of the Committee on Technology Education, refer to Korean History On-Line (<http://www.koreanhistory.or.kr>).

“Regulation of the Association for the Advancement of Government-Acknowledged Industrial Technology Education,” the key to the training policy, during the second meeting of the board of directors on February 1, 1946. The purposes of the Regulation were to: 1) dispatch students and research students abroad, 2) pay for school expenses or provide a loan for technical students enrolled in college, 3) establish or support industrial technical training facilities domestically, and 4) establish and support national scientific research. Funds for the Association were supported through state subsidies, grants, cash and other contributions, and profits from assets. The post of chair was held by the head of the Department of Commerce, U.S. Military Government Office, as before, while the posts of director of the Dept. of Commerce, director, auditor, and board members were appointed by the U.S. Military Governor.

The training policy immediately after liberation began under the directive of the U.S. Military Government Office, but Koreans who were involved in activities related to technical training during the colonial period were the ones to implement the policy. Moreover, they continued to use the training system that connected the Central Technology Research Institute and Seoul National University. The training policy was implemented using the training system of the colonial period and by Koreans who inherited colonial ways, but highly educated technicians were selected and sent to America for training immediately after liberation as part of the technical training abroad program. Many would-be technicians left for America after the mid-1950s, and people who had received technology education in America began to return to Korea after the late 1950s.<sup>5</sup> The specific content and the actual conditions of the training policy will be examined below.

## 2. Individual Policy and Actual Conditions

### 1) Dispatch of Students Abroad

The policy on dispatching students abroad had been discussed at the first board meeting on January 16, 1946. A proposal to invite one American professor to Seoul National University and to each department of the “technical vocational schools” related to industries was discussed as well as students to be chosen to

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5. For example, it is not difficult to find reports on returning overseas students such as electrical technicians who had learned their trade in America (*Dong-A Daily*, February 7, 1956).

study in America, apprentices and exam dates, exam takers, and location (Dept. of Commerce 1946). The general selection criteria for students studying in America were determined at this board meeting: graduates of vocational schools were to be enrolled in “American vocational colleges” as freshman, and graduates of college were to be enrolled in “American universities” as a junior or senior. Also the ratio of the two was determined to be 7:3. The dispatch of students abroad for technology education can be divided into two groups: early dispatch wherein the budget came from the Committee and dispatch as an extension of the aid in the 1950s.

First, students for early dispatch were selected based on the criteria mentioned above, after which they had to take a written exam in English, math, and physics, an oral exam, and a physical exam. Ten government-sponsored (96 applicants) and 14 self-paying (11 applicants) students as well as 10 government-sponsored (56 applicants) and 14 self-paying (11 applicants) apprentices were the first group to pass the examinations for overseas studies (Dept. of Commerce 1946). The number of self-paying students was greater than the original number of exam takers because government-sponsored exam takers changed their application.

Table 1 shows the dispatch results through ICA (International Cooperation Administration) funds, the biggest aid funder in the 1950s. ICA was created in 1953 under the operation of ICA and USOM (United States Operations Mission to the Republic of Korea) in Washington D.C. The number of people and cost per year from 1955 to 1961 excluding 1958 was around 250 people and US\$1.2 million, respectively. The greatest number of students sent were in the fields of mining and manufacturing, followed by public administration, agriculture/natural resources, education, transportation, social welfare/housing, and health and hygiene in that order. The total cost was small in comparison to the US\$1,738,358,000 received in ICA aid (US\$484,858,000 in facilities and US\$1,253,500,000 in raw materials), but the result of technical accumulation should not be under-evaluated considering that dispatch was linked to facilities aid.

## 2) License Examinations

Specific discussions about license examinations began at the second board meeting (Dept. of Commerce 1946). The Committee determined to issue certificates to “students studying in Manchuria, Beizhi, and Japan” who pass the license examinations and complete additional education. More concretely, certificates

**Table 1** Results of Overseas Dispatch through ICA Technical Aid Fund

(Unit: US\$1,000)

	1955		1956		1957		1958		1959		1960		1961		Total	
	# of S	Amt.	# of S	Amt.	# of S	Amt.										
agriculture/ natural resources	20	72	24	85	35	181	73	270	55	241	44	174	51	96	302	1,119
mining and manufacturing	91	425	74	354	67	303	116	401	77	361	63	330	80	123	568	2,297
transportation	33	118	26	111	32	131	20	92	22	104	16	83	12	49	161	688
health & hygiene	5	29	11	52	10	61	21	112	23	118	19	89	9	17	98	478
education	68	429	50	346	49	251	20	70	18	97	13	76	19	90	237	1,359
public adminis- tration	31	137	43	225	65	337	73	346	34	208	56	225	38	73	340	1,551
social welfare/ housing	3	14	-	-	9	40	50	120	31	98	13	55	7	13	113	340
others	-	-	5	17	10	62	15	115	12	89	2	15	5	15	49	313
TOTAL	251	1,224	233	1,190	277	1,366	388	1,526	272	1,316	226	1,047	221	476	1,868	8,145

Source: Hong 1962:78

Note: Labor field is included in "others" in 1956.

# of S: number of students

Amt.: amount

were to be issued to those who pass the top two levels of the graduation exams at technical vocational schools without coursework, to those who pass the exams at the freshman to sophomore levels at technical vocational schools, or to those who complete one to two years of coursework with job experience at factories. Moreover, bi-annual license exams for "those who work in the industries or those who desire to do so" were created through the "Guideline for Execution of License Examination for Industrial Technicians" at the third board meeting (February 11, 1946). In short, the examination level of technical school licenses was equivalent to graduating from a vocational school with four years of coursework, and applicants must have graduated from elementary school with three years of experience in a professional field. The examination level of technical vocational school license was equivalent to graduating from a three-year technical vocational school, and the applicants must have graduated from middle school or a four-year vocational school with at least three years of experience in a professional field or have passed the vocational school license examination. In addition, the examination level of technical college license was equivalent to graduating from a four-year technical college, and the applicants must have

**Table 2** Result of the 1<sup>st</sup> License Examination for Industrial Technicians (Feb. 1946)

	Chemistry	Machinery	Electricity	Civil Eng.	Construction	Mining	Metallurgy	Geology	Total
Vocational school license	2	7	31	7	0	1	1	0	49
Applicants for technical vocational school license	2	3	6	5	0	20	1	19	
TOTAL	4	10	37	12	0	3	1	1	68
Vocational school license	0	3	8	3	0	1	0	0	15
Recipients of technical vocational school license	2	1	4	4	0	1	0	1	13
TOTAL	2	4	12	7	0	2	0	1	28

Source: Dept. of Commerce 1947:259

Note: The number of recipients is the number of applicants who passed at least one subject.

graduated from technical vocational school with at least three years of experience in a professional field or have passed the technical vocational school license examination.

License examinations were executed to create a systematic pool of technicians by standardizing qualifications of those who had diverse levels of education and experience. The first set of examinations was held on September 16-September 21, 1946. There weren't many examinees, but the largest number of test takers who passed were in the much needed field of electricity, followed by civil engineering, and machinery (Table 2).<sup>6</sup>

### 3) Short-Term Training

Short-term training was implemented to quickly train skilled laborers with ability to become mid-level technicians (Bak, Ahn, and Bak 1946:15). A specific policy was discussed during the ninth board meeting (September 19, 1946), and "Guideline for Training Experienced Technicians" was prepared at the tenth meeting (September 26, 1946). Thirty people were recruited per subject based on the guideline of "those who graduated from elementary school with at least three years of experience in the mines or factories and have been recommended by the governor or mayor of Seoul as being superior in mind, spirit, and abilities"; the training period was from February 1-March 31, 1947.<sup>7</sup> The classroom

6. In addition, license examinations for radio communication technicians were also administered (*Dong-A Daily Newspaper*, April 24, 1950).

7. The training period was actually six months rather than the period specified in the guideline.

locations and subjects of training were the Central Industrial Laboratory (dyeing, weaving and spinning, machinery, electric transfer, ceramics, paper manufacturing, boiler treatment, and carpentry), Keijo Electric (electrical engineering), and the Geological Mining Research Center (mining, ore dressing, and assaying).

In the case of short-term training in the field of spinning and weaving, middle school education was given for one month and on-the-job education for five months (Table 3). In the case of machinery, privilege was provided in the form of remuneration for the cost of teaching materials and food. In the case of spinning and weaving, it was questionable that lecturers were appointed after applications were submitted, and two months passed from the time of submission to the beginning of the class. The spinning and weaving field started with 270 people in spun cotton/woven silk products, which took relative importance at the time, and ended up educating a total of 446 people; the fields of machine operation and casting began educating 120 people but ended up educating a total of 400 people. Seoul and Incheon were the two classroom locations for machinery, but Seoul National University, the Central Industrial Laboratory, and major factories in various locations were used for classroom and hands-on education in spinning and weaving.

People who had education from vocational school or higher were to be “dispatched” to America and people who had diverse types of school education were to be managed across the board with the license examinations through the training policy immediately after liberation. A clear plan was pursued to turn skilled laborers into mid-level technicians through “short-term training.”<sup>8</sup> Such a training policy was transferred to the Ministry of Culture and Education in 1949 with the founding of the Institute of Technology Education, which took on a more comprehensive and stable aspect.<sup>9</sup>

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8. Additionally, a plan to print written materials was pursued to improve technology. Plans were made to: 1) have renowned technicians in government offices, private companies, factories, and mining establishments write and publish opinions and experiences necessary to improve technology; 2) have approximately 200 manuals on actual production methods including ones on machinery, spinning and weaving, and chemical products published as a guide for employees and students; and 3) have the Bureau of Industries, Bureau of Mining, and Dept. of Civil Engineering collect and print “Reports on Tour of Business Sites” on factories, mines, and places of business through which the advantages of each industry could be exchanged and information on overseas factories and mines would be introduced (Dept. of Commerce 1946:19).

9. The founding of the Institute of Technology Education was strongly pursued under the persis-

**Table 3** Actual Operating Conditions of Short-term Technology Training Centers

	<b>Textile</b>	<b>Machinery</b>
Admission Criteria		Age 18-30, three years of middle school or elementary school graduate with three years of experience at a machine factory, and recommendation from a manager of a major machine factory
Term	Six months: Classes (middle school): 1 month/ On-the-job training: 5 months	Six months
Budget	9,087,800 won	8,987,500 won
Privilege		Food stipend (2,000 won/month), provision of
Progress	Accept applications (Oct. 1947) → applicant screening by committee and lecturers → collect teaching materials → screening test (Nov.) → selection (493 selected out of 818 applicants) → classes begin (Dec. 1)	teaching texts Seoul: Opening ceremony (Nov. 17, 1947) → Lectures begin (Nov. 20) Incheon: Opening ceremony (Nov. 26, 1947) → Lectures begin (Nov. 27)
Training and Number of People	Cotton mills/spun cotton (270), woven silks (74), knits (50), dyeing, processing, and finishing (36), hemp weaving (15), wool weaving (15), silk spinning (6): Total of 446 people	Machinery (120), casting (120), heat treatment (40), instruments (40), grinding (40), rolling (2), re-rolled steel (20): Total of 400 people
Location	Classroom Institutes: Seoul National University's College of Engineering and Central Industrial Laboratory	Sources: Dept. of Commerce, South Joseon Interim Government
		Factories: Korean Textile Co. Yeongdeung-po, Seoul: Yuhang Branch, Chagamgi Branch, Daehan Textile Co. Yeongdeung-po, Dongyang Junggi Branch Spinning Co. Keijo, Keijo Spinning Co. Yeongdeung-po, Dongyang Spinning Co. Incheon: Joseon Machinery Branch, Joseon Steel Incheon, Joseon Textile Co. Busan, Joseon Branch Hemp Manufacturing Incheon, Joseon Woolen Millyang
	On-the-Job Institutes: Seoul National University's College of Engineering and Central Industrial Laboratory	
		Factories: Daegu Spinning Co., Korean Textile Co. Yeongdeung-po/Chuncheon/Jeonju, Daejeon Owa, Daehan Textile Co. Yeongdeung-po, Dongyang Spinning Co. Keijo/Incheon, Keijo Spinning Co. Yeongdeung-po, Keijo Textile Co. Uijeong-bu, Joseon Textile Co. Busan, Dongyang Textile & Spinning Keijo, Mokpo Fabric, Seonil Silk Suwon, Joseon Fabric Suwon/Anyang, Joseon Hemp Manufacturing Incheon, Joseon Woolen Millyang, Donga Cotton Industry Busan

Source: Dept. of Commerce 1947:168-9, 188-90

### 3. Reorganization of Education Policies and Its Results

#### 1) Reorganization of Education Policies

U.S. Army Captain Earl N. Lockard came to Korea on September 10, 1945, to take charge of education at the U.S. Military Government Office and was appointed to the post of Director of Education and Management Bureau. On the day of his arrival, he held a meeting with Korean educators and renowned figures where he listened to their opinions on solving educational issues they face (Shin 1997:396). The issues they faced were reopening closed schools and the dismissal of Japanese officials and teachers and appointing Koreans in their place. Moreover, the U.S. Military Government Office established the Korean Committee on Education<sup>10</sup> on September 16<sup>th</sup> and asked advice from the committee members.<sup>11</sup> Most of the committee members were not free of Imperial

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tence of Ahn Dong-hyeok and Yi Hui-seung (Ahn 1948; Yi 1949). The Institute of Technology Education was established by a presidential edict dated March 12, 1949. It maintained the previous goal of training technicians necessary in all fields except agriculture. "The Institute of Technology Education is to provide necessary technology education to technicians for direct production by building a training center for technicians at the request of a production facility such as schools, research centers, or factories, and supplement expenses such as recurring labor costs, food and consumer goods, expendables, and facility maintenance and repair at the request from facilities that have established training centers for technicians." It requested a budget of 180 million won for 1949 in an attempt to train approximately 4,200 technicians in each of the government departments of commerce, education, national defense, postal service, finance, and internal affairs. Moreover, newspapers reported that full-scale aid was being planned because ECA (Economic Cooperation Administration) was greatly interested in this institute (*Seoul Daily News*, March 12, 1949; *Yeonhap*, March 12 and 13, 1949).

10. This committee was disbanded in May 1946 after its original goal was accomplished (Shin 1997:397).

11. The following were committee members: Kim Seong-dal, primary education (public elementary school principal); Hyeon Sang-yun, secondary education (private middle school principal); Yu Eok-gyeom, vocational education (private technical school principal); Baek Nak Jun, all levels of education (director of *Korea Times*); Kim Hwal-lan, women's education (Ewha College president); Kim Seong-su, higher education (Boseong College president); Choi Gyu-dong, general education (private middle school principal); Yun Il-seon, medical education (dean of Seoul Medical College); Jo Baek-hyeon, agricultural education (dean of Suwon Agricultural Vocational College); and Jeong In-bo, academic representative (unemployed). Kim Seong-su was appointed as advisor to the director of the Education and Management Bureau, and the returned to the Korean Committee on Education on December 18, 1945 when Yu Eok-gyeom was appointed to the post of director. He was also the chair of the advising committee to the U.S. Military Governor, which formed on October 5, 1945, and included eleven members (Shin 1997:397).

Japan's colonial period educational policies that attempted to assimilate Joseon people with Japan. All of the members played important roles in founding educational policies immediately after liberation, such as being active members of the National Committee on Education Planning, which was established in November 1945 to build long-term educational plans.

Educational policies established by such advice were concretized on October 21, 1945, through the 325<sup>th</sup> Instruction on Education for "explanations and instructions on schools." Its main content was: 1) school policies will rely on existing systems for now, 2) high- and low-ranking educational officials will be appointed by the U.S. Military Governor and Education and Management Bureau or the school affairs division in each respective province, 3) reopening of schools and primary and middle school curriculum, and 4) urgent issues related to recovering educational policies such as issues on teaching materials (Shin 1997:408). Elementary schools were reopened on September 26, 1945; secondary schools, colleges, and vocational schools were reopened on October 1<sup>st</sup> of the same year; and all schools were reopened in January of the following year (Shin 1997:398).

While the schools were hastily reopened, the U.S. Military Government Office distributed approximately 1 million teaching materials that were published in November 1945; these were distributed from January to March of 1946 to 1.7 million enrolled students (Shin 1997:401). The contents of the teaching materials were selected from American school teaching materials including *Aesop's Fables*, and the writing style changed to horizontal writing from vertical writing which was used until the colonial period.

The role played by Koreans in educational policies immediately after liberation was not as important as the role they played in the training policy, but the fact that they were not free from colonial educational policies and that the school system was reinstated as was could be viewed as having succeeded colonialism. But it is also an important fact that American influenced textbooks were distributed by the U.S. Military Government Office despite colonial remnants toward the people and system.

## 2) Results of Science and Engineering Education in Schools

There is no way to verify the results related to educational policies immediately after liberation, but highly reliable investigative results can be used to examine the results of science and engineering education. In short, the investigation consisted of directly investigating all enterprises, each institution, and a sampling of

small- and medium-sized enterprises of fifty employees or less in 1961 (Economic Planning Board 1961). First, results can be verified through developments in all graduates (Chart 1). Keep in mind, however, that the investigation consisted of the year of the employee's graduation and so the number of graduates was underestimated. The number of graduates after 1949 suddenly increased in comparison to the number in 1943 when the greatest number of students graduated in the colonial period. In other words, the result of the educational policies executed immediately after liberation appeared after 1949. Remaining is the task to reveal the reason for the decrease in the number of graduates after 1956.

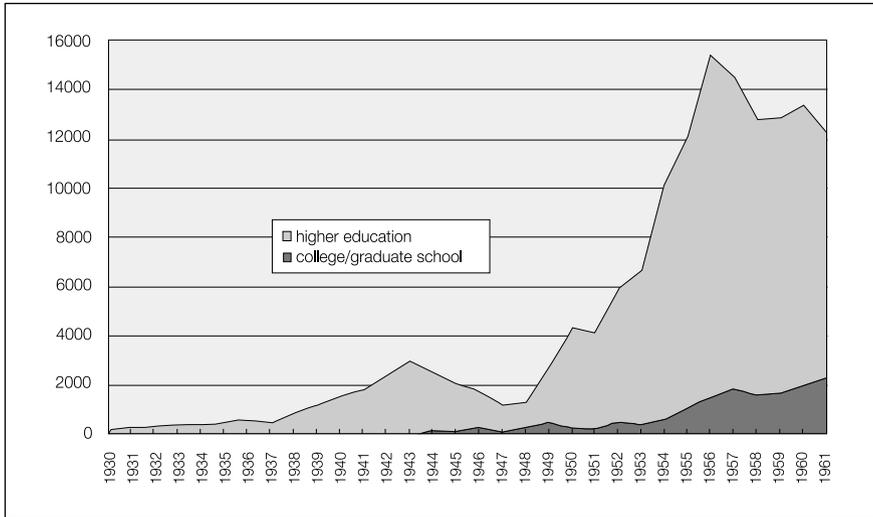
The trend among science and engineering graduates in respective industries was similar to the general trend, but the increase in graduates after 1949 is noticeable in the field of machinery, followed by civil engineering (Chart 2). The number of graduates in the field of electricity far surpassed all other fields in the mid-1950s, followed by machinery and civil engineering.<sup>12</sup>

Such a rapid increase in the number of graduates in science and engineering after 1949 dramatically changed the organization of technicians in each industry (Chart 5). In 1961, most of the technicians at small- and medium-sized businesses with fifty employees or less had a minimum of ten years of experience. If they began working immediately after graduation, they must have become employed prior to 1951. Only about 30% of the technicians in small- and medium-sized businesses were educated after liberation. But over 50% of the technicians in fields other than where the majority of technicians were, such as construction, service, mining, and quarrying, are assumed to have been educated after liberation. On the other hand, around 60% of technicians at large-sized companies are assumed to have graduated after 1951, which leads to the assumption that the majority of technicians working for large-sized companies in the early 1960s received their education after liberation. This can be verified through the fact that the turnover of technicians suddenly occurred in spinning and weaving/clothing and leather manufacturing industries as well as tanning/rubber/chemical/non-metallic materials manufacturing industries. Taken into consideration is the fact that approximately 50% of technicians who take up most of the construction and service industries were educated before liberation.

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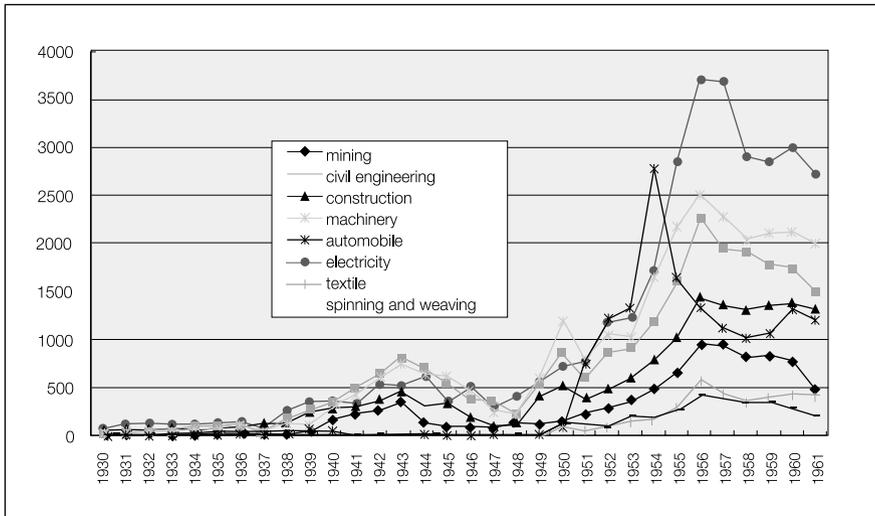
12. This can be verified through the trend in each industry and the number of employees in manufacturing industries with over five employees.

**Chart 1** The colonial period and the trend in the science and engineering graduates per education level after liberation



Source: Economic Planning Board(1961)

**Chart 2** The colonial period and the trend in the science and engineering graduates per industry after liberation



Source: Economic Planning Board(1961)

**Table 4** Experience of Technicians per Industry and Size (1961, unit: %, person)

	Large Businesses				Small & Middle Businesses			
	≤5 years	5-9 years	≥10 years	Total	≤5 years	5-9 years	≥10 years	Total
Mining & quarrying	48.5	15.9	35.5	439	20.0	20.0	60.0	25
Food/beverage & tobacco mfg.	57.6	20.8	21.5	144	29.4	35.3	35.3	85
Spinning-weaving/ clothing & leather mfg.	62.1	7.6	20.3	404	52.0	28.0	20.0	125
Timber/furniture/paper mfg. & printing-publication	57.1	19.6	23.2	112	50.0	12.5	37.5	40
Tanning/rubber/chemical/ non-metallic materials mfg.	72.8	11.5	15.7	478	43.4	18.9	37.7	265
Metallic materials mfg.	52.4	7.3	40.4	275	31.0	16.7	52.4	210
Other mfg.	80.0	6.7	13.3	30	33.3	16.7	50.0	30
Construction & Service	35.7	13.6	50.	1,879	9.4	8.0	82.6	1,750
TOTAL	47.8	14.0	38.2	3,761	18.6	2.1	69.4	2,530

Source: Economic Planning Board 1961

Note: Small- and medium-sized businesses (fifty or fewer employees).

### III. Aid and Introduction of Technology

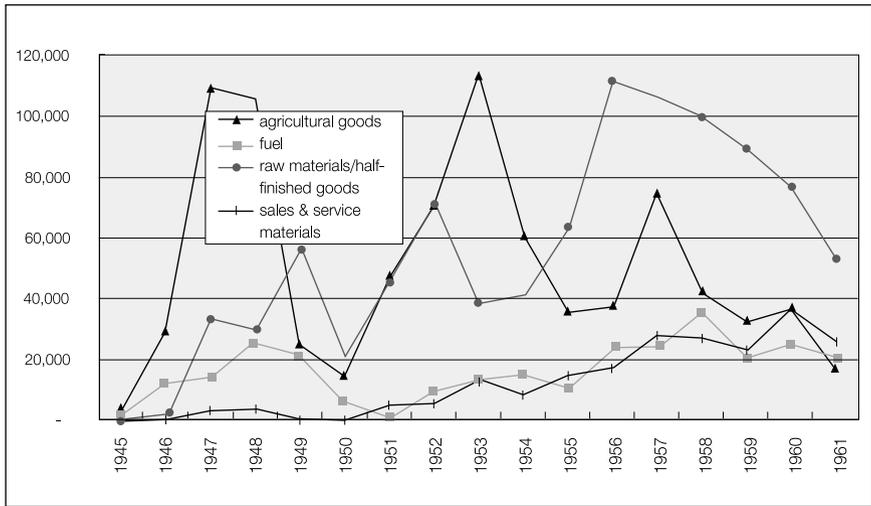
#### 1. Changes in the Distribution of the Aid and the Introduction of Technology

##### 1) Trend in the Amount of Aid Introduced Per Industry

Accumulation of technology after liberation to the 1950s was achieved not only through training and educational policies but through the introduction of aid as well. I will first attempt to reconsider the characteristics of the aid through changes in the amount of aid introduced per category. Aid at the time favored raw materials rather than facilities materials, and can be seen when the total amounts of aid introduced in charts 3 and 4 are compared.

The contents of the field of raw materials, however, show a different aspect. First, agricultural goods composed of provisions and agricultural supplies took up a relatively large amount immediately after liberation and during the Korean War but suddenly decreased after 1953 (Chart 3). On the other hand, raw materials/half-finished goods increased until the mid-1950s so that categories necessary for the reconstruction of industries continued to increase even in the field of raw materials and surpassed agricultural materials after 1955.

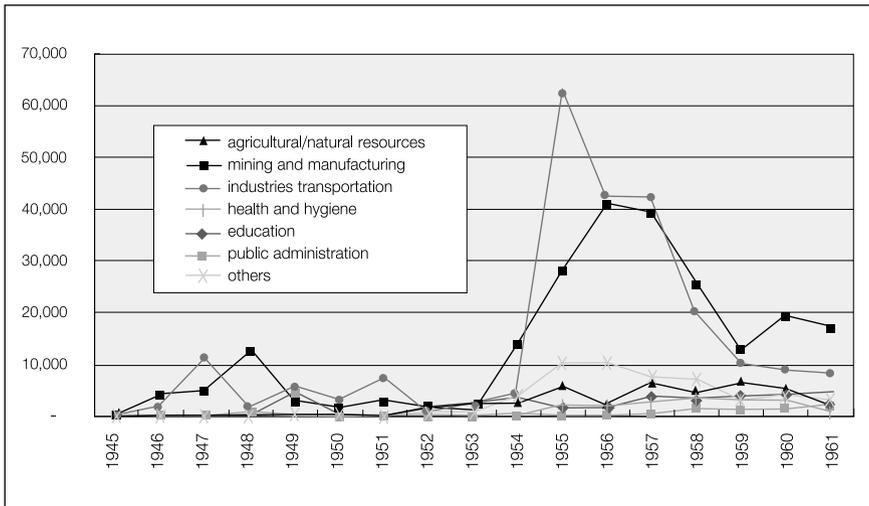
**Chart 3** Introduction of aid in raw materials perindustry (Unit: US\$1,000)



NOTE: GARIOA, ECA, SEC, CRIK, UNKURA results were recalculated based on the ICA classification.

Source: Hong Song-You (1962:49, 52-3, 56, 60-2, 75-7)

**Chart 4** Introduction of aid in facilities materials perindustry (Unit: US\$1,000)



NOTE: GARIOA, ECA, SEC, CRIK, UNKURA results were recalculated based on the ICA classification.

Source: Hong Song-You (1962:49, 52-3, 56, 60-2, 75-7)

The aid introduced in facilities materials suddenly increased in the mid-1950s but suddenly decreased in the late 1950s in the transportation field in which railroads took up unconditional weight and in mining and manufacturing, which included electric power and manufacturing, and processing took up the greatest amount in each of the periods in 1955-56 and 1957-58 (Chart 4).

## 2) Introduction of Technology From the U.S.

We will next look at how the introduction of technology changed from colonial Japan to after liberation and in the 1950s. Newspaper reports from the time were examined because published primary materials by and large do not exist.<sup>13</sup> Taiwan, Austria, and France introduced one piece of technology; the U.S. introduced the most, followed by West Germany, and the introduction of technology from Japan increased after the latter half of the 1950s.<sup>14</sup>

Introduction of technology from the U.S. began during the process of recovering facilities for electric power immediately after liberation. For example, seven Americans visited Korea for a five-to-six-week inspection tour on June 23<sup>rd</sup> to solve the electric power problem after power was cut off from North Korea (May 14, 1948).<sup>15</sup> They met with electric companies and delegates of the Chamber of Commerce and Industry who represented the users, and visited each region to study electric power generation and the conditions for establishing a thermoelectric power plant (Korea Development Bank 1955:244; *Dong-A Daily Newspaper*, June 24, June 29, July 1, July 13, and July 20, 1948). Thus, the introduction of technology from the U.S. that began immediately after liberation became more active in the process of the above-mentioned aid. The following section examines the introduction of technology from the U.S. in the 1950s by looking at the construction processes of Mungyeong Cement Factory, Incheon

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13. Articles on the introduction of technology was searched by typing the keyword “technology” on Korean History On-Line (<http://www.koreanhistory.or.kr>) and extracted results among 2,995 of the newspaper categories based on titles. After which they were categorized based on the conditions of introduction of aid per country.

14. The articles contained duplicate information; thus, only their trend will be explained here because determining the amount of technology introduced from the U.S., West Germany, and Japan is not only hard but meaningless.

15. The Americans included one technician from the Corps of Engineers, Duquesne Electric Power & Light Co., and Connecticut Electric Service Company, along with a former technician from Detroit Edison Company, a hydraulics geographer, the president of Pioneer Mining Co. in Kansas, and the U.S. Army Port Commander of Philadelphia.

Plate Glass Factory, and Chungju Fertilizer Factory, which was constructed through the aid process and one of the three priority industrial factories of the time.

## 2. Examples of the Introduction of Technology: Establishment of Chungju Fertilizer Factory

### 1) Priority Industries and Chungju Fertilizer Factory

The energy industries of electric power and mining as well as the cement, plate glass, and fertilizer industries which increased construction and agriculture were chosen as priority industries in the 1950s (Kim 2002:19-26).

Cement and plate glass were absolutely necessary in various industrial facilities, housing, bridges, roads, and irrigation facilities. In the case of fertilizer which was essential for increasing food production, there was an urgent need to build a fertilizer factory because Heungnam Fertilizer Factory, whose output accounted for 90% of the total production in the colonial period, was located in North Korea. A Danish construction company began construction of Mungyeong Cement Factory in November 1955, and a Panamanian construction company began construction of Incheon Plate Glass Factory in February 1956; both factories were opened in September 1957. In comparison, the American construction company of McGraw-Hydrocarbon Co. began construction of Chungju Fertilizer Factory in September 1955 but only completed it in 1961.

The construction amount provided domestically for Chungju Fertilizer Factory was 2.75 billion Korean *hwan*, which was a little more than the amount of building Mungyeong Cement Factory (2,522,812,000 *hwan*) but around four times the amount of Incheon Plate Glass Factory (744,211,000 *hwan*). In the case of foreign currency, Chungju Fertilizer Factory amounted to US\$34,749,000, which was approximately four times the amount used to build Mungyeong Cement Factory (US\$8,992,000) but around ten times the amount spent on Incheon Plate Glass Factory (US\$3,205,000). Indeed, the process of securing such a great amount of aid delayed the construction of Chungju Fertilizer Factory.

### 2) Details of Construction

Construction of Chungju Fertilizer Factory began when Chemical Construction

Corporation, an American company, was commissioned to select the construction site including preparatory evaluation of technology after United Nations Korean Reconstruction Agency secured US\$1 million of aid funding in 1953. The Chungju region was selected because its location was such that securing industrial water, electric power, and coal as well as transporting manufactured products was easy (Dept. of Commerce and Industry 1957). On the other hand, McGraw-Hydrocarbon was selected as a result of Foreign Operation Administration, another organization providing aid, soliciting the NRC (National Research Council) of America for technical evaluation to choose a construction company after securing US\$23 million in aid fund in 1954. The selection criteria were: 1) appropriateness of manufacturing method, 2) ability or lack thereof to build, and 3) experience or lack thereof to build similar factories. The major content of the signed contract between the construction company and the Korean government was to design and build a factory that had the ability to produce 250 tons of urea fertilizer per day with over 45% of fixed nitrogen within 30 months and provide technical training as well as guarantee the performance through a test drive. But it was impossible to build within the planned time: six months of technical evaluation and eight months for receiving additional funds were added because the Korean government requested that the plant's fuel equipment be transformed so that Korean produced anthracite could be used. Besides, the construction cost doubled and the construction period was delayed by 21 months as a result of five revisions to the contract due to increases in construction costs including facilities materials and labor costs (Chungju Fertilizer Co. 1968:81-8). Thus, the reasons for the increase in construction costs and the lengthy delay were: 1) payment of construction costs was based on reimbursement of actual costs and a fixed pay system, 2) there was not a clause in the contract that clearly outlined claims for losses or damages, 3) overconfidence in the company recommended by the organization providing aid, and 4) the fuel for the power plant was not settled on from the beginning. In spite of these, Chungju Fertilizer Factory which was planned and built in the 1950s succeeded in becoming an alternative to importing fertilizers and played a primary role in the chemical industry, which was the key industry of the Korean economy in the 1960s.<sup>16</sup>

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16. Refer to Lee Dae-Keun (2002:513) and Yamada (1971:141-219).

### 3) Process on Technical Training

Securing technicians became more vital when construction of the factory was almost completed and was faced with a test drive (Chungju Fertilizer Co. 1968:112). The Dept. of Commerce and Industry, which led the factory construction, recruited sixty-five engineering college graduates and provided them with preparatory training domestically, after which twenty-six were sent to America and eighteen to Switzerland to be educated from August 1958 to May of the following year. They focused on the fields of chemical engineering, chemistry, machinery, and safety. These students were hired as technicians after they returned to Korea. In addition, turbine drivers, skilled workers at a power plant, instrument technicians, and other machine repairers and electricians were recruited and technical training was provided at the same time. The selection method was changed in the second round at the end of 1958, so seven of the students recruited to study overseas at engineering colleges were evaluated and hired jointly by Korea and America. The technical group thus secured made it possible to operate the first factory independently; they participated in the construction of the third and fourth factories, and were promoted to middle management at each factory. They played an important role in propagating technology by penetrating in great numbers chemical factories such as Honam Fertilizer and Korea Fertilizer.

Even after the factory was operating smoothly, a technical training center was established in October 1962 to provide technical manpower necessary in each chemical factory to be built as part of the five-year economic development plan. The training center for Chungju Fertilizer Factory accepted fifty-six enrollees for the first time in March of the following year and continued to play a key role in transmitting chemical technology in the 1960s.

## **IV. Results of Building Human Resources and Introducing Technology —Trends in Invention and Device Patents**

Invention and device patents are useful tools for examining the results of accumulated technology. The process of registering invention and device patents can be said to be an institution that ultimately acknowledged the establishment of one technological system even if the conditions of accumulated technology were

different. Thus, comprehensive results of the building of human resources and the introduction of technology can be verified through an analysis of registrations.

Submission of patent applications immediately after liberation was executed in 1947 after the Patent Office was established on January 22, 1946. Its name changed to the Patent Bureau on October 5<sup>th</sup> and U.S. Military Government Ordinance #44 placed it under the jurisdiction of the Department of Commerce the same year (Patent Bureau 1959:11). The rate of registering inventions and patent applications in 1948-58 was 15%, which was understandably lower than those of Italy (84.4%) and France (90.5%) where applications were not evaluated, but it was also significantly lower than the U.S. (57.3%), Great Britain (49.0%), Germany (32.6%), and Japan (30.4%) where applications were evaluated.

When each year is viewed, not one case was registered despite the submission of 236 invention patents, which are close to foundation technology, and 240 device patents, which are vested on applied products in everyday life, in the first year of application submission (Chart 6). Thereafter, the number of registrations was not consistent but slowly increased in 1952, and thereafter the rate of registration began to increase.<sup>17</sup> The chemical category had the greatest number of invention patents and the next was the machinery category. The number of registrations of device patents was overwhelming in the machinery category but the electric and chemical categories were on the low side.

When invention and device patents are compared with that of the colonial period, The highest number of device patents during the colonial period occurred in 1935 with thirty-five, but this number was surpassed after 1954 (Chart 5). The absolute number of registration is too low to assume that its trend reflects changes in the accumulation of technology as is, but we should be able to use it to say that the effort to build human resources after liberation began to show results in the mid-1950s.

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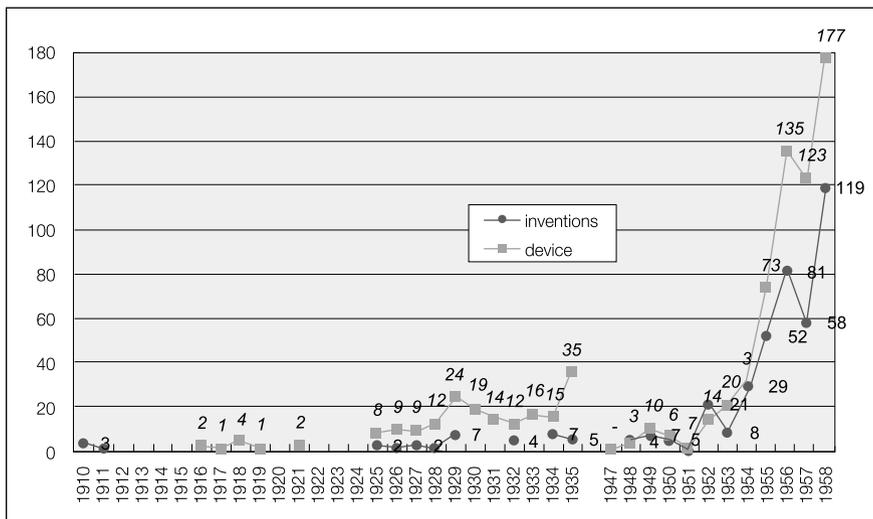
17. The recipient of the very first invention patent (sulphur dye manufacturing) after liberation was Ahn Dong-hyeok, director of the Committee on Technological Education and chancellor of the Central Industrial Laboratory at the time (Patent Bureau 1959:209).

**Table 5** Trend in applications and permits of invention and device patents after liberation

	Inventions								Devices							
	Machinery		Electrical		Chemical		Application Registration Total	Machinery		Electrical		Chemical		Application Registration Total		
	App.	Reg.	App.	Reg.	App.	Reg.		App.	Reg.	App.	Reg.	App.	Reg.			
1947	110	0	35	0	91	0	236	0	195	0	40	0	5	0	240	0
1948	103	0	9	0	57	4	169	4	151	2	7	0	8	1	166	3
1949	136	5	22	0	75	2	233	7	207	9	8	1	14	0	229	10
1950	73	2	3	1	50	2	126	5	109	6	7	0	7	0	123	6
1951	12	0	4	0	14	0	30	0	28	1	0	0	1	0	29	1
1952	60	4	2	0	29	17	91	21	67	13	0	1	2	0	69	14
1953	46	3	2	1	28	4	76	8	142	19	3	0	7	1	152	20
1954	71	14	5	0	56	15	132	29	167	28	5	1	3	2	175	31
1955	80	14	9	0	67	38	156	52	260	70	4	2	17	1	281	73
1956	140	31	8	3	139	47	287	81	450	123	17	6	27	6	494	135
1957	194	19	20	1	255	38	469	58	690	108	31	6	37	9	758	123
1958	243	32	25	1	287	86	555	119	973	163	79	7	53	7	1,105	177

Source: Patent Bureau 1959:348-9

**Chart 5** Trend in registration of invention and device patents in the colonial period and after liberation



NOTE: The number of Koreans' patent registration in the colonial period. Total invention patents were 384 in 1947-58, of which 22 patents were held by foreigners.

Source: Patent Bureau, Dept. of Commerce (1959: 326-32, 348-9)

## V. Conclusion

Korea's economy immediately after liberation repeatedly went through chaos. But human resources, which was most important to reconstruction in the late 1950s and the sudden development since the late 1960s, have been relatively systematically prepared through trial and error since liberation.

In particular, the training policy begun under the direction of the U.S. Military Government to provide technicians and highly skilled laborers was led by Koreans who had accumulated technological and administrative capabilities in the colonial period. This policy can be considered systematic because: 1) preparation was made to send people abroad in order to cultivate highly skilled technicians; 2) license examinations were implemented as a way to verify diverse skills with a consistent standard and to secure a continuous supply of manpower; and 3) short-term training was carried out in order to secure a stable supply of skilled laborers by providing connections among institutes for national policies, colleges, and factories. The U.S. Military Government Office reconfigured school education by means of obtaining advice from Koreans in the field of education, the result of which was the rapid expansion in the number of science and engineering students who graduated since the mid-1950s. Much of the raw materials from the aid were consumer goods on the one hand, but raw materials and partially finished products increased until the mid-1950s and played an important role in industrial rebuilding. Moreover, technology was introduced during the process of increasing the importance of facilities materials, especially in mining and manufacturing industries.

Technology was smoothly introduced since the mid-1950s in preparation for full-scale industrialization in the 1960s because the U.S. Military Government Office and the Korean government systematically improved the system of training skilled laborers and the school educational system after liberation. This fact is comparable to the American experience in the first half of the 19<sup>th</sup> century and the Japanese experience in the latter half of the 19<sup>th</sup> century. Productivity in the U.S. gradually increased in the first phase of its industrial period through changes in production structure and then productivity suddenly increased due to the introduction of technology through investment in facilities in the second phase, whereas training of technicians occurred in Japan's early industrial peri-

od, which made it possible for a smooth investment in facilities thereafter.<sup>18</sup> These patterns make it possible to assume that labor productivity of colonial Joseon gradually increased until the end of the 1920s and is similar to the pattern that suddenly increased through investment in facilities since the mid-1930s after recovery from the Great Depression (Gil 1996:137-40; Rosenberg 1972; Uchida 1990).

The result of building human resources and introducing technology can be verified, although through an indirect index, by the fact that the number of invention and device patent registrations suddenly increased as of the mid-1950s.

Lastly, if the process of building human resources and introducing technology after liberation until the 1950s is evaluated from the perspective of the continuity and discontinuity of history, then it is a legacy of colonial days in terms of the system and main manager. But it was also a process of creating a new Koreanized system for supplying human resources via vocational education, dispatch of highly skilled technicians, and the introduction of technology with foreign aid after the 1950s as the influence of the U.S. grew.

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18. See Kim Duol and Park Ki-Joo (2004) on changes in labor productivity in the colonial period and Sun Jae Won's (2005) rudimentary examination related to changes in labor productivity and the supplying of technology.

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