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Article

Employment and Human Development for Foreign Civil Engineer in Japanese Construction Industries

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Abstract. This thesis extracts the facts and issues on employment and human development for foreign civil engineer in Japanese construction industries and proposes the solutions to potential future problems. Compared to other industries, aging of workers and engineers in construction industries has been ongoing rapidly. And Japanese construction industries require recruitment foreign skilled workers and civil engineers to make up this shortage of workers and engineers. This thesis focuses on foreign civil engineers and studies issues from the both sides of foreign civil engineers and Japanese employers. Additionally, it proposes sustainable solution for Japanese construction industries to achieve long term employment of foreign civil engineers. Especially, Japan's qualifications processes and multi-layered subcontractor system composed of prime contractors and lower subcontractors are highlighted as important points of foreign civil engineers. Interviews on foreign civil engineers and their Japanese managers and management personnels were taken place and collected data such as reasons of preference of Japanese contractors, motivations, career development plan from foreign civil engineers, and recruitment criteria, promotion system, training and education programs from their Japanese managers and management personnels. Based on these data and studies, this thesis analyses and concludes key solutions on long term employment and human development for foreign civil engineers in Japanese construction industries.

Keywords: Population aging phenomenon in Japan, foreign civil engineer employment, career development program, Japanese construction industries, multi-layered subcontractor systems.

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1. Introduction and Issues on Japanese Construction Industries

Major four characteristics of current situation and issues on Japanese construction industries are shown in the following sub-chapters in respect of this thesis.

1.1. Aging Issues of Japanese Construction Industries

Japanese population has been decreasing rapidly since 2008 at the peak with 128,080 thousand. According to Japan's National Institute of Population and Social Security Research, it predicts the future population in 2065 will be 88,080 thousand from 1,286,170 thousand in 2029, and ratio of over 65 years old will be 38.4% from 28.4% in 2019 [1, 2].

Decline and aging issues of employees in Japanese construction industries are more serious. The number of construction employees is 4,920 thousand and 28% decreased from 6,850 thousand in 1997 at the highest year [3].

In addition, ratio of employees aged over 55 years in Japanese construction industries accounts for 34% and ratio of employees aged under 29 years in the same industries accounts for 11% in 2016, compared to 29% and 16% respectively in all Japanese industries.

On the other hand, after Japanese construction investment amount reached record highest 84 trillion Japanese Yen, declined to 41 trillion in 2010 at the lowest and gradually increased again around 50 trillion in recent years.

As one of solutions to decline and aging issues of employees in Japanese construction industries, technical intern trainee program has been introduced and making up for shortage of construction workers in Japan.

Foreign engineers and workers in Japanese construction industries increased more than 4 times from 13 thousand persons in 2011 to 55 thousand persons in 2017. Among them, technical intern trainees increased from 7 thousand persons in 2011 to 37 thousand persons in 2017.

Number of employees categorized as engineers has been declined from 410 thousand in 1997 to 310 thousand in 2016. Meanwhile, number of employees categorized as skilled workers has been declined from 4,550 thousand in 1997 to 3,260 thousand in 2016, and especially aging phenomenon is quite obvious for specific skilled workers such as carpenter and plasterer [3].

Although current Japanese construction investment amount has been stabilized, shortage of human resources i.e. skilled workers and engineers has been facing serious situation.

1.2. 1.2. Multi-layered Subcontractor System

Multi-layered subcontractor system is one of key characteristics in Japanese construction industries.

Multi-layered subcontractor system means a contractor makes contract as prime contractor with a ultimate client, and the prime contractor makes sublet some job to other contractors as subcontractors, and these subcontractors sublet some portions of their jobs to other contractors as sub-subcontractors again on the premise that legally allowed. These layers consist of several layers depending on volume and specialties of the prime contract. A prime contractor takes place construction management of performance and workers such as health, safety, environment (HSE) of subcontractors.

Multi-layer subcontractor system is prevailed for large size contract packages except some contract required special technical factors in Japan [4, 5].

Salaries of larger size companies are higher than smaller size companies according to the statistics published by Japanese Tax Authority. This tendency is more obvious than manufacture shown in Table 1. Based on statistic data issued by Japanese Tax Authority, the total salary is calculated by use of the number of employees and the total amount of salary income belonging to the companies which hire more than 31 employees, and the average salary is calculated by use of the total number of employees and the total amount of salary income in Japan.

Therefore, foreign construction engineers are not exceptional in terms of salary level disparities [6].

1.3. Eligibility Requirements for Public Works in Japan

Construction law stipulates that construction license is required for persons to sign a contract and carry out construction work to some extent volume. This license shall be reviewed and revised every five years and granted by Minister of Land, Infrastructure, Transport and Tourism or a prefectural governor.

Especially, every year, business review shall be taken place to evaluate eligibility requirements for public works such as size of enterprise, financial records, number of qualified engineers and skilled workers, welfare and safety records, performance of past construction and determine size of work, and type of work to participate tender.

In addition, every two years, Ministry of Land, Infrastructure, Transport and Tourism assesses eligibility to participate in tender competition based on the abovementioned business review, and categorize four classes A, B, C, D from the bigger project budget for each contractor [7].

Number of qualified engineers and skilled workers is one of key factors for contractors to gain higher point in business review, foreign engineers are also expected to obtain qualifications such as certified civil engineering construction management engineer.

Table 1. Annual Salary by Company's Employee Size in year 2022.

(Thousand Japanese Yen)

number of employee	less than 10			10 to 30	more than 30						average
		1～4	5～9		31 to 99	101 to 499	500 to 999	1,000 to 4999	5,000 or more	total	
average annual salary construction industry	3,817	3,410	4,103	4,673	4,789	5,453	6,291	7,443	8,202	5,841	4,883
average annual salary manufacturing industry	3,216	2,972	3,357	3,615	4,051	4,573	5,390	6,356	7,153	5,387	5,012

1.4. Overseas Expansion of Japanese Construction Industries

Japanese government decided to initiate so called "Infrastructure System Export Strategy" and announced "High Quality Infrastructure Export Initiative" as one of the most important measures for "International Development Strategy" and "Japan Revitalizing Strategy" in 2013. Medium and small size projects dealt by medium and small size enterprises in corporation with local governments were also chosen by Japanese government to support to encourage export using Japanese Official Development Assistance (ODA) Program. Japanese government set the target order amount 30 trillion Japanese Yen in 2020 based on the order amount 10 trillion Japanese Yen in the year 2010. And the order amount reached 25 trillion Japanese Yen in 2018.

Succeeding this policy, "the 47th ODA Infrastructure Strategic Committee" (2020 revised version) and Ministry of Land, Infrastructure, Transport and Tourism announced that Japanese government will support medium and small size enterprises which have high level technologies to expand their business to overseas.

Moreover, "Infrastructure System Export Strategy 2025" (June 2023 revised version) [8] changed the policy from "All Japan" to "CORE JAPAN" . This "CORE JAPAN" policy encourages partnership with foreign local enterprises and sets the target 35 trillion Japanese Yen in 2025. This policy aims not only to export from Japan but to invest and produce with local partners in order to give benefits to local enterprises in counterpart countries.

However, Japanese construction industries, even large size companies do not have enough engineers to manage overseas construction business outside Japan. In addition, percentage of number of medium and small size enterprises in Japan is more than 99 % and percentage of number of employees working for medium and small size enterprises in Japan is more than 70 %. From a financial and human resource point of view, medium and small size enterprises shall be restricted from taking risk to expand their business overseas. Their intention on overseas business expansion is less than 1 %, and capital investment, research & development and wage increase in Japan are put on for high priorities. According to the survey on future vision for all industries, 13 % of enterprises put the highest priority on globalization but only 6 % construction companies put the highest priority on globalization [9].

Although Japanese private construction companies are not able to follow Japanese government's overseas expansion policy due to their capabilities, some construction companies including large, medium and small size feel a sense of crisis on growth of the future Japanese construction market and seek growth chances to overseas market.

Employment of foreign engineers is one of the solutions to expand business to overseas.

1.5. Structure of this Thesis

The structure of this thesis consists of five chapters as follows.

The first chapter is introduction: current situation and issues on Japanese construction industries.

The second chapter is theme of this thesis, review of previous thesis, creativities and effectiveness of this thesis.

The third chapter is qualifications and certifications of civil engineer and related issues of foreign civil engineers.

The fourth chapter is interview held with foreign civil engineers and Japanese managers and its analysis.

The fifth chapter is conclusion.

2. Theme of this Thesis

2.1. Theme of this Thesis

As the countermeasures to solve two major issues (i.e. phenomena of low birthrate and aging population and overseas business expansion), employment of foreign civil engineers to some extent is an urgent issue for Japanese construction industries.

This thesis explores sustainable satisfaction conditions and training and human development programs for foreign civil engineers who are expected to work for Japanese construction industries and overseas ODA projects as long term Japanese company's employees.

2.2. Hypothesis of this Thesis

This thesis forms hypothesis focusing on two major characteristics in institutional and structural aspects of Japanese construction industries.

Firstly, multi-layered subcontractor system affects characteristics of foreign civil engineers such as graduating universities and other sources at each layer level.

Secondly, high level Japanese language is required and this issue is a major barrier in order to satisfy qualification systems stipulated by Quality Assurance Act for civil

engineers in Japan, and preparing minutes and reporting at construction sites in Japanese language is also required.

On the other hand, from the point of intrinsic motivation theory proposed by Edword Deci [10], this thesis infers that not only wage level but also other satisfaction factors are significant effective for long term employment for foreign civil engineers. This thesis also infers that employers gain the merit of long term employment by providing foreign civil engineers with those factors.

2.3. Theoretical Rationale and Research Method of this Thesis

This thesis studies on employment and human development for foreign civil engineer in Japanese construction industries based on the theory of structural-functional analysis proposed by Talcott Parsons [11].

In addition, interviews were conducted with foreign civil engineers and their managers regarding training, human development programs, and promotion systems based on the three key elements of intrinsic motivation theory i.e. improvement of autonomy, efficiency, relationship proposed by Edward L. Deci [10]. This theory is grounded in "Organization theory" developed by Chester I. Barnard [12], and "five hierarchy of human needs" such as self-realization and social needs developed by A.H. Maslow [13].

Specific method is applied to this study using the interview and analysis method so called "life history method" for the study on employees' motivation with Japanese construction companies based on the works of Ninomiya [14, 15, 16].

Interview survey was conducted on foreign civil engineers, their employers and managers who work for several sizes of Japanese construction enterprises such as a large, semi-large, medium and small size enterprise and staffing agencies belonging to different categories of multi-layered subcontractor system.

2.4. Review on Previous Theses and Originality of this Thesis

2.4.1. Review on existing research and issue

To verify the originality and efficiency of this thesis, previous thesis on foreign employee in Japan are reviewed and categorized into eight groups.

First group is three theses on employment of foreign engineer and their experience. Kaoru SONODA studied on the relationship between of Japanese traditional employment systems and company's attitudes to recruit foreign workers [17]. Yukiko MURAKAMI studied on the employment of foreign scientists and engineers in Japan, focusing on the reasons for the employment, overseas activities, and their roles and contributions [18]. Gikhan GOKUTAG mentioned his own experiences on his job as a foreign engineer, requirement of high level Japanese language, features of Japanese management.

Second group is four theses on education and training for skilled worker and engineer. Takako IDE studies on how construction certifications impact motivation of skilled worker and engineer [19]. Yoshio YOSHIOKA mentioned his experiences as a lecturer on education for foreign engineers [20]. Hitoshi SUGIMOTO studies on remote teaching method of Japanese language before the COVID-19 pandemic [21].

Third group is two theses on the issues from the point of foreign engineers. Gikhan GOKUTAG mentioned the efficiency of collaboration between engineers and skilled workers as a Japanese business feature [22]. Minoru ITO studies on the difficulties for foreign engineers working in Japan such as seniority based wages system, low English proficiency among Japanese engineers, and insufficient job manuals [23].

Forth group is six theses on the issues on Japanese and English languages. Yukiko MURAKAMI studied on the necessity of improvement of English level for Japanese engineers to work with foreign engineers in Japan [18]. Minoru ITO studies on the lack of communication arisen from low English level of Japanese engineers and difficulty on achievement of high Japanese language level for foreign engineers [23]. Hitoshi SUGIMOTO studies on the necessity of pre-learning Japanese language for foreign engineers to be employed by small and medium size enterprises as immediately effective stuffs [21]. Motoya TAKAGI studies on prevention countermeasures against industrial accidents for foreign workers due to a lack of communication caused by low language level [24]. Motoya TAKAGI also studies on the risk of industrial accidents for foreign technical intern trainees due to insufficient understanding of safety rules caused by low Japanese language level and unique aspects of Japanese culture [25]. Phengse CHHOUR studies on the necessity of teaching Japanese construction technical terms for Cambodian technical intern trainees [26].

Fifth group is the manual handbook on how to use high skilled foreign professionals. FUJITSU RESEARCH INSTITUTE edits the manual on recruitment, and long term employment of high skilled foreign professionals with Japanese companies [27].

Sixth group is seven theses on the facts and problems faced by foreign workers, foreign technical intern trainees and specific skilled workers. Kazuyuki HAYAKAWA studies on the possibility of passing on high skills to Japanese-Brazilian workers in small and medium size manufacturing industries [28]. Kenichi ABE studies on the general aspects of Japanese immigration control system and foreign workers at the early stage of this issue in 1995 [29]. Hiroshi KOMAI studies on the surveys of working and living conditions of foreign workers in Japan, and the cases of Europe and the United States [30]. Chieko KANBAYASHI studies on the relationship between the issue of industrial sustainability in the aging areas in Japan and the needs of foreign worker employment [31]. Phengse CHHOUR studies on the necessary improvement points of working conditions for foreign technical intern trainees and the prevention

countermeasures against their disappearance [26]. Akira KITANAKA studies on the merits and demerits of foreign technical intern trainee program and the specific skilled worker program from the point of employers [32]. Ryota MASUYAMA studies on the survey of the foreign technical intern trainee program and the specific skilled worker program, and activities for improvement of technical skills and Japanese language proficiency [33].

Seventh group is four theses on South Korea's employment system for foreign workers. Koji SANO studies on the adaptation background and merits of South Korea's employment system for foreign workers compared with Japan's foreign technical intern trainee program and specific skilled worker program [34, 35, 36]. Yuichi TAKAYASU studies on the facts of South Korea's employment system for foreign workers [37].

Eighth group is two theses on industrial accidents for foreign workers. Motoya TAKAGI studies on prevention countermeasure against industrial accident for foreign workers in construction industry [24]. Motoya TAKAGI also studies on the survey of foreign technical intern trainees and their employers, data collection on industrial accidents for foreign workers in the construction industries and specific occupational safety and health issues for foreign workers, and shows their countermeasures [25].

2.4.2. Originality of this thesis

Many researches have been carried out and several issues have been pointed out through the existing theses.

In addition, manuals on education and human development for foreign engineers, and promotional materials for staffing companies to introduce foreign engineers who graduate from foreign universities are found out.

However, theses in the past are not found to study on the relationship between foreign construction engineers and multi-layered subcontractor system in Japan, or interview survey from the point of intrinsic motivation theory [10] conducted on foreign civil engineers, their employers and managers with several sizes of Japanese construction enterprises such as a large, semi-large, medium and small size enterprise and staffing agency belonging to different categories of multi-layered subcontractor system.

2.5. Efficiency of this Thesis

This thesis aims to identify factors and countermeasures to achieve long term sustainable employment of foreign civil engineers through interviews with foreign civil engineers, their employers and managers and collecting facts and analysis.

In terms of the level of satisfaction for foreign civil engineers, focusing on the factors such as not only wages but also other non-monetary factors related to intrinsic motivation, this thesis indicates the efficient proposals for both foreign civil engineers and Japanese employers by identifying the essential factors on recruiting and employment conditions.

3. Residence Status System for Foreign Employees in Japan, and Required Qualifications and Capabilities for Civil Engineers

3.1. Categories of Residence Status System for Foreign Employees in Japan, and Position of Civil Engineers

Foreign employees in Japan are divided into six categories according to the statistics issued by Ministry of Health, Labour and Welfare.

(a) Professional, technical
(b) Nurse, caregiver, etc.
(c) Technical intern trainee
(d) Exceptional part time
(e) Status-based residence
(f) Unknown

Based on the statistics, the comparison table of number of foreigners by residence status in Japan between 2023 versus 2018 is shown in Table 2, There is an effort to avoid the impact on restriction of immigration due to COVID-19 pandemic as much as possible [38].

As of Oct. 2023, total number of foreign residence in Japan is 2049 thousand in total and 145 thousand foreign employees are categorized in construction industries among those residence, increased by 40% in total, and increased by 110% in construction industries respectively from year 2018. Compared to total incremental ratio, incremental ratio of construction industries is much higher. Table 2 shows that recent foreign work force demand of construction industries is higher than other industries. In addition, as mentioned in Section 1.2, it is speculated that this is due to a labor shortage in each layer because increase of both technical/humanities/international business (T/H/I) workers and technical intern trainees occurs.

As of Oct. 2023, Table 2 also shows technical intern trainee is 89 thousand, T/H/I is 13 thousand, specific skilled worker is 12 thousand, and permanent visa holder is 11 thousand in construction industries.

From the point of making up for a shortage of labor by hiring foreigners, the three categories such as technical intern trainee, T/H/I, and specific skilled worker are the main labor sources except permanent visa holder.

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Table 2. Number of Foreigners by Residence Status in Japan in 2023 vs 2018.

	as of end of Oct. 2023			as of end of Oct. 2018			difference 2023vs2018		
	all industries total	construction industries		all industries total	construction industries		all industries total	construction industries	
	no. of person	no. of person	%	no. of person	no. of person	%	no. of person	no. of person	%
total no. of foreign residence	2,048,675	144,981	7.1%	1,460,463	68,604	4.7%	588,212	76,377	2.4%
(a) professional, technical	595,904	26,978	4.5%	276,770	5,994	2.2%	319,134	20,984	2.4%
technical/humanities/international business	366,168	13,212	3.6%	213,935	4,946	2.3%	152,233	8,266	1.3%
specific skilled worker	138,518	12,333	8.9%						
(b) nurse, caregiver, etc.	71,676	7,651	10.7%	35,615	3,280	9.2%	36,061	4,371	1.5%
(c) technical intern trainee	412,501	88,830	21.5%	308,489	45,990	14.9%	104,012	42,840	6.6%
(d) exceptional part time	352,581	844	0.2%	343,791	442	0.1%	8,790	402	0.1%
foreign student	273,777	382	0.1%	298,461	231	0.1%		151	0.1%
(e) status-based residence	615,934	20,676	3.4%	495,668	12,894	2.6%	120,266	7,782	0.8%
permanent visa holder	371,296	10,764	2.9%	287,009	7,061	2.5%	84,287	3,703	0.4%
spouse of Japanese	100,977	3,605	3.6%	89,201	2,264	2.5%	11,776	1,341	1.0%
spouse of permanent visa holder	18,076	1,334	7.4%	13,505	792	5.9%	4,571	542	1.5%
long-term resident	125,585	4,973	4.0%	105,953	2,777	2.6%	19,632	2,196	1.3%
(f) unknown	79	2	2.5%	130	4	3.1%	−51	−2	−0.5%

This thesis focuses on T/H/I as the main subject of study. Conditions and qualifications of each category are shown in Table 3.

3.1.1. Foreign technical intern trainee

Among 19 working statuses, as of Oct., 2023, number of technical intern trainee is the highest number with 413 thousand persons and increased by 34% from 309 thousand in 2018. And number of construction industries technical intern trainee is 89 thousand and increased by 93% from 46 thousand in 2018.

Technical intern trainee program is criticized because actual purpose is working labor force, which is different from the nominal purpose as international contribution for unskilled foreign workers to acquire skills through training. And working condition is sometimes very poor and non-payment of wage and missing from recipient organization occurs [39].

3.1.2. T/H/I workers

As of Oct. 2023, number of T/H/I is 366 thousand persons, and increased by 71% from 214 thousand in 2018. And among construction industries, T/H/I is 13 thousand and increased by 325% from 4 thousand in 2018. Number of T/H/I is lower but increased ratio is higher than technical intern trainees, and it is understood that its needs is very high.

As seen in Table 2, the number of T/H/I and specific skilled worker are the majority of (a) Professional, technical. T/H/I status is one of 29 statuses of residence stipulated by Immigration Control and Refugee Recognition Act (the Immigration Act). The status of T/H/I can be granted to the foreigners who have university graduate degree and/or business experience to some extent as business experts, or work for the jobs which require specific requirements and capabilities based on foreign culture or sensitivities.

Due to revision of the Immigration Act in June, 2016, two statuses i.e. technical and humanities/international business have been integrated into the residence status of T/H/I. Four residence periods are set forth such as 5 years, 3 years, 1 year, 3 months granted by the Immigration Bureau.

3.1.3. Specific Skilled Worker

In 2023, number of specific skilled worker is the second largest after T/H/I among professional, technical statuses in Table 2. This status was stipulated in 2018 for the purpose of replenishing expert and technical human resources in several industrial fields and has started in April 2019.

The maximum residence period for a specific skilled worker is five years, monitoring by a certified support organization is required, and technical skill level and Japanese language proficiency (more than the N4) shall be certified through immigration processes.

Purpose of specific skilled worker is work itself and this status is different from technical intern trainee.

It is criticized that reality of technical intern trainee is not training but employment as a labor force and some companies do not pay salaries and working conditions do not meet official regulations. This is one of the reasons to stipulate specific skilled worker status. In addition, foreigners who finish the No.2 technical intern trainee program with good performance may obtain specific skilled worker status. Family accompaniment right is given to specific skilled worker No.2 status [40, 41, 42, 43].

3.2. Required Qualifications for Civil Engineer and Skilled Workers in Japanese Construction Industries

Japanese Construction Business Law and other related laws and acts are stipulated and supervised under the administrative jurisdiction of Ministry of Land, Infrastructure, Transport and Tourism.

Regulations of qualifications of civil engineer, the act on promotion of quality assurance, and qualifications for assigned engineer stipulated in Japanese Construction Business Law and other related laws and acts are described in the following subsections.

Table 3. Conditions of Foreigners by Residence Status in Japan.

	professional, technical	technical intern trainee	specific skilled worker
Academic background	university graduation	high school graduation	post technical intern trainee exam passing qualification for specific skilled worker
Visa categories of residence status system for foreign employees	technical/humanities/international business	technical intern trainee (No. 1,2,3)	specific skilled worker (No. 1,2)
Job type	professional, technical job	certified ocupations (83 listed job only)	certified ocupations (14 listed job only)
Host institutiona and conditions	direct employment with enterprise	supervising organization	direct employment with enterprise
Period of stay	1 year or above	maximum 5 years	No.1 5 years No.2 no limit

3.2.1. Regulations in the construction business review

Japanese construction companies are required to obtain a construction business license (every five years renewed) from Minister of Land, Infrastructure, Transport and Tourism or a prefectural governor in case of undertaking construction contract more than 5 million Japanese Yen.

Especially, construction companies require the construction business review every year to undertake public works. Size and type of construction is determined based on size, financial condition, number of certified engineers, safety records and other technical factors.

Open competitive tenders are introduced to public works. But to secure quality of works, and to avoid unfair activities, competitive qualification system is introduced and renewed every two years. Companies are categorized into one of four ranks ABCD from high to low. And, they are eligible to participate bids only to their categorized rank projects [7].

Number of professional engineers, certified civil management engineer, and certified skilled worker are counted as points of evaluation for construction business review. Therefore, foreign engineers are also expected to obtain the above certifications [7, 44].

3.2.2. Regulations of the comprehensive evaluation method stipulated by the act on promotion of quality assurance

Regulations of the comprehensive evaluation method has been introduced by the Act on Promotion of Quality Assurance which has been enacted in April 2005.

Two types of the comprehensive evaluation method such as evaluation of performance capability type and evaluation of technical proposal type are stipulated [45].

As for performance capability type, evaluation ratio between price point and technical point are 6:4. Technical point is composed of construction plan, technical capability, capability of engineer to be assigned. Construction plan is evaluated by pass or fail, not by point. Share of the point of capability of engineer to be assigned is 50% in technical point and 20% in total.

As for technical proposal type, evaluation ratio between price point and technical point are 4:6. Technical point is composed of technical proposal, technical capability, capability of engineer to be assigned. Share of the point of capability of engineer to be assigned is 25% in technical point and 15% in total [45].

In addition, overseas project experience, which is recognized by the overseas infrastructure engineer awards system held by Ministry of Land, Infrastructure, Transport and Tourism, has been counted as an evaluation point of capability of engineer to be assigned since 2021 [46].

As mentioned above, because the point of capability of engineer to be assigned for bidding projects adopting the comprehensive evaluation method type is relatively high, factors of construction experience, performance, awards are very important for engineers including foreign

engineers to be assigned as a chief engineer for the designated project.

3.2.3. Qualifications for assigned engineer

According to Japanese Construction Business Law, a chief engineer shall be assigned for contract and performance of a construction project except less than 5 million Japanese Yen contract price. This regulation applies to both public and private works.

First grade, second grade of national qualification, registered core technician (skilled worker), engineer with 10 years or more construction experience and etc., are recognized as requirements of a chief engineer.

In case that more than 40 million Japanese Yen subcontract is made, specified construction business license company is required to assign a person who holds first grade national qualification or a person recognized by Ministry of Land, Infrastructure, Transport and Tourism as a supervising engineer.

A company is required to assign a chief engineer for not only prime contract, but also subcontract.

Even for foreign engineers, first and/or second grade qualifications are required to be assign as a supervising engineer and/or chief engineer.

3.3. Required Japanese Language Level for Foreign Civil Engineer

For foreigners, Japanese language level to some extent is required to work on Japanese construction projects as construction engineers. Qualifications stipulated by Japanese Construction Business Law, documentation such as minutes with clients, and meetings at construction sites are required to the same levels as much as Japanese engineers.

Japanese language level required to obtain qualifications stipulated by Japanese Construction Business Law, and to fulfill performance at construction sites are described as below.

3.3.1. Required Japanese language level for qualifications of civil engineer

As described in Subsection 3.2, foreign engineers also require to obtain qualifications stipulated by Japanese Construction Business Law.

Examinations for three main qualifications i.e. professional engineer, certified civil management engineer (first & second class), and certified technician (skilled worker) are conducted in Japanese language.

Japanese language used on the examinations is high barriers to pass the examinations for foreigners.

Japanese language used on the examinations includes technical terms and kanji. Foreigners who graduated from Japanese universities and studied construction-related courses in Japanese can acquire and understand Japanese level to pass the examinations. However, foreigners who graduated from overseas universities need great efforts to reach Japanese level to pass the examinations.

Moreover, reading examinations for professional engineer, the First-Class Civil Engineering Works Execution Managing Engineer, and certified technician (skilled worker) are conducted in Japanese language including kanji.

Table 4. Yes/No: Hiragana Added to Kanji on Reading Test for Each Qualification.

Qualification category	adding Hiragana to Kanji in written test	
	yes	no
The First-Class Civil Engineering Works Execution Managing Engineer	レ	
Professional Engineer		レ
First class certified carpenter		レ
Certified slinger	レ	

as of 2022FY

Some reading examinations add hiragana to kanji to give convenience to foreigners shown in Table 4.

The author inquired the Japan Society of Professional Engineers on language issues used in the examination for Asia-Pacific Economic Cooperation (APEC) engineer. Only Japanese language is used when the exam is taken place in Japan. Conversion of foreign APEC engineer's title to Japanese professional engineer is limited to Australia and some limited sections.

Regarding certified technician (skilled worker), first class carpenter exams did not add hiragana to kanji in 2022. On the contrary, certified slinger exam added hiragana to kanji. It varies by occupations and is not unified.

Ministry of Health, Labour and Welfare provides supplemental text books for certified technician (skilled worker), which are translated Japanese into 13 foreign languages for foreigners to understand technical terms and pass the exams [47].

Educational institutions which are registered to each Prefectural Labor Bureaus take place certified technician courses in foreign languages for foreigners [48].

3.3.2. Required Japanese language level for civil engineers at a construction site in Japan

There are two types of engineering capabilities required at construction sites for civil engineers i.e. onsite

job and offsite job. Recently, proportion of offsite job volume has been increasing.

Especially, offsite job volume has been increasing i.e. safety control, coordination with client, and construction management by construction manager and staff including meeting with client and documentation such as progress report. On the contrary, onsite job volume directly related to site construction such as setting out, construction plan, and schedule has been decreasing relatively. This phenomenon decreases On the Job Training (OJT) opportunities for young engineers to learn site construction technics and know-how [49].

In addition, site engineers shall work for long overtime to make documentation and reports at the office after onsite management such as progress and quality control during normal business hours according to the hearing from a Japanese construction engineer by the author.

As mentioned above, engineers are required to spend a long time to attend a meeting with a client and make documentation. These jobs require high level Japanese language.

Japanese-Language Proficiency Test is prevailing in Japan to measure Japanese language level for foreigners. This test consists of listening and reading. Writing is not included. There are five levels from N1 to N5. to be scored. To obtain Japanese residence status such as highly skilled professional, T/H/I, technical intern trainee, certified technician (skilled worker), certificates of Japanese-Language Proficiency Test must be submitted for application. However, this test does not measure speaking or writing level, and even foreign civil engineers with high Japanese level (N1, N2) may not have enough Japanese communication capabilities for construction jobs in Japan [50].

3.4. Required Qualifications and Experiences for Civil Engineers for Japanese Official Development Assistance (ODA) Projects

Japanese government decided to initiate so called "infrastructure system export strategy" in 2013 as described in Subsection 1.4, Japanese construction companies are expected to extend business to overseas market such as Japanese ODA projects aggressively.

Japanese ODA project has two types of financial scheme such as grant aids and Yen loans. For both types of projects, requirements of engineers to be assigned to the projects are set by evaluation of elements such as project type, size, technical difficulties. However, Japanese qualifications stipulated by Japanese Construction Business Law are not required for Japanese ODA projects.

Japanese Construction Business law does not apply to Japanese ODA projects. Contractors registered in the Organization for Economic Co-operation and Development (OECD) countries including Japan are eligible to participate in tender in accordance with OECD rule, and engineer's experience and career of construction projects are set as requirements for Japanese ODA projects in order to maintain fair competition.

Engineer's experience and career in construction projects both in Japan and overseas are set and accepted as requirements, and language other than Japanese such as English, French, Spanish is also set as requirement for each project. Requirements for several projects are shown in Table 5. English is mainly used as a language, but French or Spanish are used for some projects depending on the recipient countries.

As described in Subsubsection 3.2.2, overseas project experience recognized by the overseas infrastructure engineer awards system held by Ministry of Land, Infrastructure, Transport and Tourism has been counted as an evaluation point of engineer's capability for Japanese construction projects since 2021 [46].

4. Current Situation and Issues on Foreign Civil Engineers in Japan

In this section, the author conducted interview with foreign civil engineers and their managers and executives. Data such as purposes of employment, motivation, intention, future's career plan are inquired and collected from foreign civil engineers. In addition, data such as recruitment process and criteria, personnel system after joining companies, career development program for foreign civil engineers provided by the companies are inquired and collected from the managers and executives.

4.1. Collection of Data from Interview by Using Life History Method

Life history method is adopted for the interview. Using life history method, data on career, intrinsic motivation and its changes at past, present, future stages are collected from interviewees on condition of anonymity [16].

Interview questions are categorized into three parts based on the three key elements of the intrinsic motivation theory i.e. improvement of self-determination, competence, relationship proposed by Edward L. Deci described in Subsection 2.3. In addition, basic data such as nationality, education are gathered shown in Table 6.

The list of interviewees are shown in Table 7.

Japan's multi-layer subcontractor system, which is one of key characteristics in Japanese construction industries described in Subsection 1.2, is the main reason to select these companies and foreign engineers.

Nine companies from major, semi-major & first layer, middle, marine & first layer, specialist contractor first and/or second layer, rural/small-medium second and/or lower layer, staffing agency to Japanese domestic & overseas project are chosen. And eight foreign engineers and seven Japanese managers and executives are interviewed. Number of sampling data is limited, but individual actual data can be collected using life history method rather than statistic collection data.

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4.2. Characteristics of Each Layer as Specific Results

Characteristic results of each layer such as graduating universities, job assignment, Japanese language level, qualifications and others are shown in this Subsection 4.2 as below.

4.2.1. Characteristics of each layer on graduating universities

It turns out that there are characteristics of each layer on graduating universities shown in Table 8.

Table 5. Qualification for Japanese ODA project.

Name of Project				Access road construction to Matabari port	Rehabilitation railway between Yangon and Mandaley	Access road construction in Monbasa port area	TCAD center building construction
Country				Bangladesh	Myanmar	Kennya	Ethiopia
Year of Tender call				2022	2020	2017	2019
Project Overview				Link road between port and existing road	Rehabilitation of existing railway	Coastal road around port	Training center building construction
	Type of Project			road & bridge	railway trucking	road & bridge	building
Finance				Yen loan	Yen loan	Yen loan	Grant
Qualification	Project Manager (Site Representative)	Education		-	bachelor degree		
		Experience	Total period	20	15	20	
			Similar position	10	5	15	
			Same position			8	
			Same type of work	-	5 railway		
		Qualification		-	-		
		Language					English
	Contract Manager	Education		-			
		Experience	Total period	20			
			Similar position	10			
			Same position				
			Same type of work	-			
		Qualification		-			
		Language					
	Deputy Project Manager	Education			bachelor degree		
		Experience	Total period		15	15	
			Similar position		3 Project Manager	10	
			Same position			6	
			Same type of work		5 Civil work		
		Qualification					
		Language					
	Quality Control Manager	Education		-			
		Experience	Total period	20			
			Similar position	10			
			Same position				
			Same type of work	-			
		Qualification		-			
		Language					
	Highway Engineer	Education		-			
		Experience	Total period	15		15	
			Similar position	5		10	
			Same position			6	
			Same type of work	-			
		Qualification		-			
		Language					
	Track Construction Manager	Education			bachelor degree		
		Experience	Total period		10		
			Similar position		3		
			Same position				
			Same type of work		3 railway		
		Qualification			-		
		Language					

Table 6. Question to Interviewee.

	foreign civil engineer	boss and/or management
basic data	nationality age sex Japanese language level English language level final education in home country final education university major former occupation name of the company year of joining the company current job current job site/place job carreer in the company living with family or single	relationship with foreign cinil engineer in the company
autonomy	job assignment rewarding and sense of accomplishment to job assignment self determination level job and technical proposal to boss	job assignment level level difference between foreign and Japanese engineer
efficiency	qualification acquisition goal career development plan presented by the company (job rotation etc.) awards and rating to the achievement expectations from the company self achievement goal to the assigned job career development plan in this year, and future 5/10/20 years	evaluation criteria on foreign engineer encouragement program for qualification acquisition future expectations to foreign engineer
relationship	informal activities with Japanese engineers (similar age/senior, attendance on daily meeting dirrerence of promotion and treatment level between foreign and Japanese engineers networking activities with in and outside foreign engineers outside activities (university, community etc.)	collabolation level with Japanese engineers confirmetion of requirement with job assignment sharing and following goal and task attending regular meetings social gathering lunch meeting co-research for Japan Society of Civil Engineers etc. unofficial private activities
others	satisfaction level to the company rewarding instructors other than formal boss	

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Table 7. List of Interviewee.

category of layer	company	foreign civil engineer			boss/management	total
		site engineer	sales	researcher		
major, semi-major & first layer	A		1		1	2
	B			1		1
	C	3				3
middle & first layer	D				1	1
specialist contractor, first and/or second layer	E	1		1	1	3
rural/small medium second and/or lower layer	F	1			1	2
staffing agency for Japanese domestic project	G				1	1
	H				1	1
staffing agency for overseas project	I				1	1
total		5	1	2	7	15

Table 8. Origin of Foreign Civil Engineer by Each Category of Layer.

category of layer	origin of foreign civil engineer		
	student graduated from Japanese university	student graduated from overseas university (origin of country)	others overseas project recruitment, private connection etc.
major, semi-major & first layer	レ		
middle, marine & first layer	レ	レ	
specialist contractor, first and/or second layer		レ	レ
rural/small-medium second and/or lower layer		レ	
staffing agency for Japanese domestic project		レ	
staffing agency for overseas project		レ	レ

Major, semi-major & first layer construction companies recruit foreign civil engineers who graduate from Japanese universities.

Although Japanese construction industries face a problem of running short of human resources of engineers, major, semi-major & first layer construction companies relatively recruit new graduate civil engineers including foreign civil engineers easily because the companies' business conditions are stable, and the companies are providing high salaries, high fringe benefit, and high reputations.

Foreign students who graduate from Japanese universities also tend to choose to work for major, semi-major & first layer construction companies, and Japanese universities and professors have strong relationship with those major, semi-major & first layer construction companies. Therefore, it is easier for companies to recruit foreign graduates.

Major marine & first layer construction companies recruit foreign engineers who graduate from both from Japanese universities and foreign universities by means of interview test at their countries. According to the interviewee's company, other Japanese major marine & first layer construction companies hires foreign civil engineers on a fixed-term basis for each overseas project.

Specialist contractor first and/or second layer construction companies are difficult to recruit foreign civil engineers who graduate from Japanese universities because their salaries and fringe benefits are lower than major, semi-major & first layer construction companies. Therefore, those companies recruit foreign civil engineers who graduate from foreign universities and/or select and recruit on an indefinite basis among engineers hired on a fixed-term basis for overseas projects.

Rural/small-medium second and/or lower layer construction companies recruit foreign engineers who graduate from foreign universities by means of interview test at their countries because their salaries and fringe benefits are lower than specialist contractor & first and/or second layer contractors.

Staffing agencies for Japanese domestic projects recruit foreign civil engineers who graduate from foreign universities and give trainings such as Japanese language and business manner before formal recruitment because their salaries and fringe benefits are lower than rural/small-medium second and/or lower layer construction companies.

Only one staffing agency for overseas project is interviewed, and this company recruit mainly Philippine engineers in Philippine and dispatch them to overseas projects all over the world undertaken by prime major, semi-major & first layer construction companies.

4.2.2. Characteristics of each layer on job assignment

It turns out that there are significant characteristics of each layer on job assignment shown in Table 9.

Major, semi-major & first layer construction companies tend to assign foreign engineers to overseas projects as a construction manager or staff. Japanese civil engineers are assigned to domestic projects as usual, and foreign civil engineers are expected to utilize their English capability for expanding business to overseas market including Japanese ODA projects.

Major marine & first layer construction companies also tend to assign foreign civil engineers to overseas projects because of their English capability.

Specialist contractor first and/or second layer construction companies recruit foreign civil engineers as an overseas project manager or staff, but they are assigned to domestic project as an assistant to a Japanese manager when there are no overseas projects to be assigned.

Rural/small-medium second and/or lower layer construction companies assign foreign civil engineers mainly to domestic projects as a site manager or staff, however foreign civil engineers are expected to be assigned to business expansion jobs to their home countries sometimes.

Staffing agencies for Japanese domestic projects assign civil foreign engineers to domestic projects as an assistant to a prime contractor.

Table 9. Work Place and Job Description of Foreign Civil Engineer by Each Category of Layer.

category of layer	work place		job descripition
	domestic (Japan)	overseas	
major, semi-major & first layer	partially	mainly	construction management at site, sales
middle, marine & first layer	partially	mainly	construction management at site
specialist contractor, first and/or second layer	partially	mainly	construction management at site
rural/small-medium second and/or lower layer	mainly		construction management at site
staffing agency for Japanese domestic project	mainly		assistance to construction management at site
staffing agency for overseas project		mainly	assistance to construction management at site

Table 10. Japanese Language Level of Foreign Civil Engineer by Each Category of Layer.

category of layer	Japanese language level	
	necessity	achievement level
major, semi-major & first layer	high	high
middle, marine & first layer	medium	unknown
specialist contractor, first and/or second layer	medium	low
rural/small-medium second and/or lower layer	high	medium
staffing agency for Japanese domestic project	medium	medium
staffing agency for overseas project	low	low

Table 11. Qualifications of Foreign Civil Engineer by Each Category of Layer.

category of layer	qualifications of construction business law		work place	
	necessity	achievement level	domestic (Japan)	overseas
major, semi-major & first layer	high	high	partially	mainly
middle, marine & first layer	low	unknown	partially	mainly
specialist contractor, first and/or second layer	high (promotion prerequisite)	low	partially	mainly
rural/small-medium second and/or lower layer	high	partially	mainly	
staffing agency for Japanese domestic project	low	low	mainly	
staffing agency for overseas project	not necessary			mainly

Staffing agency for overseas projects assign foreign civil engineers to overseas projects as an assistant to a Japanese prime contractors i.e. major, semi-major & first layer construction companies, because major, semi-major & first layer construction companies tend not to recruit foreign civil engineers as regular employees as much as possible to reduce fixed cost of the companies.

4.2.3. Characteristics of each layer on Japanese language level

It turns out that there are significant characteristics of each layer on Japanese language level shown in Table 10.

Major, semi-major & first layer construction companies recruit foreign civil engineers who graduate Japanese universities, therefore their Japanese language level is already high and they have no difficulty to work in Japanese language, in addition English communication capability is also required for overseas projects.

Major marine & first layer construction companies recruit foreign civil engineers only as an overseas project manager or staff, therefore English language proficiency is preferred over Japanese proficiency.

Specialist contractor first and/or second layer construction companies require foreign civil engineers to acquire sufficient Japanese proficiency enough to communicate with Japanese engineers in Japanese because they are assigned to domestic project as an assistant to a Japanese manager when there are no overseas projects to be assigned. They spend long time to study Japanese.

Rural/small-medium second and/or lower layer construction companies require foreign civil engineers to acquire high Japanese proficiency because they are assigned as a domestic project site manager or staff and the qualifications are required by Japanese Construction Business Law, and documentation in Japanese is also required. Foreign civil engineers who graduate from foreign universities spend long time to acquire Japanese language before coming to Japan.

Staffing agencies for Japanese domestic project offer Japanese language and business manner courses in foreign countries before foreign engineers come to Japan. Foreign civil engineers who achieve beginner reading and speaking Japanese language level such as N4 level of Japanese-Language Proficiency Test are assigned to domestic construction projects. They are encouraged to acquired qualifications depending on individual capabilities. Jobs of technician (skilled worker) is also included in their designated jobs.

Staffing agency for overseas project assign foreign civil engineers to overseas project construction sites. They are required to communicate with Japanese technician (skilled worker) in Japanese at beginner's speaking level, but overall high English communication level is required to instruct works to local workers and make documentations in English.

4.2.4. Characteristics of each layer on qualifications and others

It turns out that there are significant characteristics of each layer on qualifications and others shown in Table 11.

Three categories of layers such as major, semi-major & first layer construction companies, major marine & first layer construction companies, and specialist contractor first and/or second layer construction companies encourage foreign engineers to acquire qualifications such as the First-Class Civil Engineering Works Execution Managing Engineer. On the other hand, overseas projects require experiences, foreign language proficiency such as English, contract management skills such as claim control, and documentation skills.

Rural/small-medium second and/or lower layer construction companies require foreign civil engineers to acquire qualifications such as the First-Class Civil Engineering Works Execution Managing Engineer because main projects are located in Japan.

Staffing agencies for Japanese domestic project encourage foreign civil engineers to acquire qualifications such as certified civil management engineer, certified technician (skilled worker).

Staffing agency for overseas project does not require foreign civil engineers to acquire qualifications.

The companies which belong to middle, marine and first layer hire foreign civil engineers mainly for the purpose of overseas projects which require English capability, but do not require qualifications such as the First-Class Civil Engineering Works Execution Managing Engineer as shown in Table 5. Rural/small-medium second and/or lower layer construction companies make contracts as prime contractors in rural areas in Japan and the clients require the qualifications such as the First-Class Civil Engineering Works Execution Managing Engineer to the chief engineers for the projects. Qualifications such as the First-Class Civil Engineering Works Execution Managing Engineer are not required for staff engineers who work under the certified chief engineer according to the construction law in Japan.

5. Summary and Proposal

Based on these analysis, considerations and solutions on the identified issues are presented in this section.

5.1. Common Satisfaction Factors and Issues among Each Layer

Based on the interview, long term sustainable employment, intrinsic factors and their related issues are abstracted and analyzed from the points of both foreign civil engineers and Japanese employers. In addition, minutes and policies on foreign university graduates and other foreign workers held by Ministry of Land, Infrastructure, Transport and Tourism and other official organizations have been publicly available on homepages and other media. The author also joins Japan Association

of Small and Medium-sized enterprises for Overseas Construction which is managed by Ministry of Land, Infrastructure, Transport and Tourism, and the author also attends meetings and have discussions with several government officers. Interviews to some companies shown in this paper were also carried out by use of these opportunities.

Common satisfaction factors and issues of foreign civil engineers among each layer, and those of their employers and managers are shown in this Subsection 5.1.

Table 12. Factors of Satisfaction.

employment terms		treatment (promotion)		job description		counseling	network with the same country colleagues	family accompaniment
regular employment	fixed-term employment	the same as Japanese	different from Japanese	job type	membership type			
high expectation	some major marine contractors	high expectation	expert with fixed term by some major marine contractors	high expectation	accepted as present	important	important	high effectiveness

5.1.1. Common satisfaction factors for foreign civil engineers among each layer

There are a variety of motivations for foreign civil engineers to work with Japanese construction companies such as country political and economic conditions, individual motivations and family situations and etc., however common satisfaction factors are abstracted by the collection data of the interview shown in Table 12.

Not only foreign civil engineers but also foreigners who come to live in Japan generally have admiration and interest for Japan's unique culture, safety, history and etc., in addition to their salaries.

Foreign civil engineers expect to be treated equally as the same as Japanese employees at work and employment conditions. They also prefer job type employment contract more than membership type employment contract.

Foreign civil engineers with the same origin of the country tend to share information on salary, fringe benefits, and other conditions. The satisfaction factors other than salary and other monetary conditions are found to be counseling for mental stress arisen from foreign living outside their home countries, communication with the colleagues who come from the same country, and family accompaniment.

5.1.2. Common satisfaction factors for Japanese superior and/or management among each layer

Japanese managers and employers expect foreign civil engineers to work for permanent or long term as the same as Japanese employees. On the contrary, it is the problem that foreign civil engineers tend to leave the company within a short period even when they are hired as regular employees.

The purpose of employment of foreign civil engineers differs from each layer to which the companies belong. However, a minimum Japanese level is required to perform job. Especially, comprehensive high Japanese language level such as reading, writing, listening, speaking is required for foreign civil engineers to be assigned as a domestic project site manager or staff because the qualifications are required by Japanese Construction Business Law, and documentation and meeting with clients in Japanese is also required.

However, their salaries and other treatments tend not to exceed Japanese employee's level because Japanese employers and employees do not accept exceptions for foreign civil engineers.

5.2. Considerations on the Results of Interview

The reasons and backgrounds of the results of interview described in Section 4 are considered.

It turns out that multi-layer subcontractor system determines employment conditions of foreign civil engineers.

5.2.1. Recruitment stage

Because that major, semi-major & first layer construction companies have advantages on salaries, fringe benefits, prestigious reputations more than other layers, they can recruit Japanese civil engineers more easily than other layers although Japanese construction industries are running short of human resources in general.

On the other hand, foreign civil engineers who graduate from Japanese universities have many opportunities to be recruited by major, semi-major & first layer construction companies because they can take advantages of connections between university professors and Japanese companies. Especially, number of foreign civil engineers who graduate from Japanese universities are limited, and university career support center and supervising professor introduce them to companies to be hired after graduation.

Second and/or lower layers are facing the serious problem i.e. shortage of civil engineers. Rural/small-medium second and/or lower layer construction

companies and staffing agencies for Japanese domestic project recruit graduates from foreign universities because most of graduates from Japanese universities are recruited by major, semi-major & first layer construction companies.

There are specific consulting companies and official agencies such as the Japan External Trade Organization (JETRO) and local public agencies support for those companies to recruit foreign civil engineers by means of providing interview with foreign university graduates.

Staffing agencies for Japanese domestic project have functions to supply supplemental human resource to rural/small-medium second and/or lower layer construction companies. They give minimum Japanese and business manner lessons required at construction sites to foreign civil engineers.

5.2.2. Conditions and requirements for long-term employment

Many executives and managers expect foreign civil engineers to work for long term employment. The followings are conditions and requirements for long term employment.

Job type employment system is preferred to membership type employment for foreign civil engineers.

Counselling and mental health care treatment had better be provided by the companies. Even staffing agencies for Japanese domestic project address these points.

Periodical communications with Japanese executives are one of crucial factors for foreign civil engineers to confirm their positions and expectation in the companies.

Family accompaniment is useful to mitigate stress.

However, fixed term employment with high salary as an expert rather than long term employment is another option to hire foreign civil engineers on project basis.

Rural/small-medium second and/or lower layer construction companies and staffing agencies for Japanese domestic projects tend not to have sufficient inhouse human development program as Off the Job Training (OFFJT) compared to major, semi-major & first layer construction companies. These programs are required for foreign civil engineers to work for long term from the point of satisfaction.

Supporting systems after recruitment given by the third parties such as JETRO and local public agencies are not sufficient compared to those at the timing of recruitment.

OFFJT courses such as the First-Class Civil Engineering Works Execution Managing Engineer, level up Japanese language, mental counseling and future carrier plan program should be provided. And manual should be published on these specific measures.

5.2.3. Social relationship for foreign civil engineers

In Japanese societies, three organizations have reciprocal stakeholder relationships as shown in Fig. 1.

Each organization has own function and depends on the others. For example, the public sector gives permissions and qualifications to the private sector i.e. general contractors. General contractors commission research to universities. Universities give advice to the public sectors at official councils.

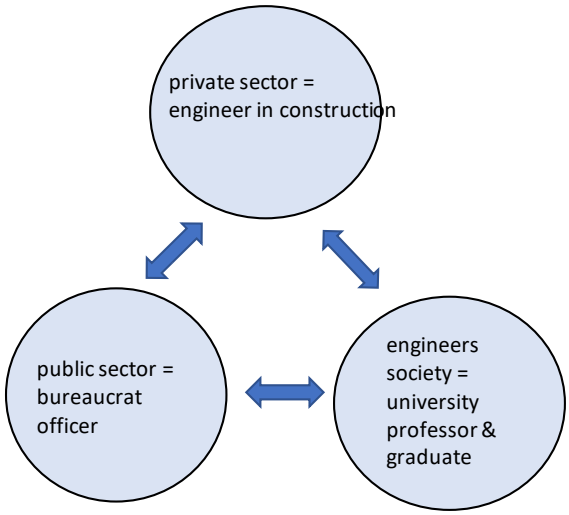

Fig. 1. Relationship among 3 Social Organizations.

Japanese graduates, including foreigners who graduate from Japanese universities, start to work at one of social organizations and build social networks among them.This tendency is also observed in graduates who graduated from Bandung Institute of Technology in Indonesia and Chulalongkorn University in Thailand.

Foreign graduates from Japanese universities tend to be recruited by Japanese major, semi-major & first layer construction companies not only because of their own capabilities of students but also because the companies expect professors' social influence power and job placement of Japanese graduates in the future.

On the contrary, foreign civil engineers who graduate from overseas universities and recruited by Japanese companies have no such networks in Japan and belong only to the recruited companies.

The government, public institutions and community should provide the First-Class Civil Engineering Works Execution Managing Engineer, level up Japanese language, mental counseling and future carrier plan program and manuals. The employing company should provide job description, future carrier plan program and bringing family members program. The employed foreign individual should make efforts to build communication network among the same country foreigners.

5.3. Proposal

In summary of this study, the authors present the following five proposals to encourage foreign civil engineers and Japanese companies to facilitate long term and satisfactory employment on both sides.

First, employers give presentations to candidates of foreign civil engineers that there are two carrier paths for foreign civil engineers i.e. work for Japanese domestic construction projects or overseas ODA construction projects before employment. Especially, Japanese domestic construction projects require qualifications stipulated by Japanese Construction Business Law and the Act on Promotion of Quality Assurance. Therefore, Japanese language is essential for foreign civil engineers. On the other hand, overseas ODA construction projects require experiences, negotiation capabilities with clients, management capabilities of subcontractors. Therefore, such experiences and capabilities should be obtained through planned job rotations of overseas and Japanese domestic projects and OFFJT programs.

Second, through periodical dialogs and communications with managers and executives, their current position in their carrier path in the company, should be recognized by foreign civil engineers. The author had experience that local engineers left the company suddenly for which the author worked as the representative in Kyrgyzstan in 2021. According to a JICA expert who dispatched to Kyrgyzstan, Kyrgyz people tend to consider working with the same company for a long time is incompetent in general. Recognitions of job carrier by foreign civil engineers are different from those of Japanese civil engineers. Japanese employers expect long term employment and provide employees with OJT and OFFJT. On the contrary, foreign civil engineers aim for job type employment and are less hesitant to change jobs. It is necessary to make solutions to bridge this gap.

Third, foreign civil engineers had better understand in advance before employment that multi-layer subcontractor system is one of key characteristics in Japanese construction industries and salaries and fringe benefits are different depending on the layers. Therefore, each company that employs foreigners should explain the differences by tier at the timing of interview before employment.

Forth, reports and documentations in English had better be accepted in Japanese construction projects and English had better be available for examinations of three main qualifications described in Subsubsection 3.3.1.

Fifth, OFFJT and recurrent programs for example construction management education, AI deep learning analysis method [51, 52] had better be provided to foreign civil engineers by organizations such as Japan Society of Civil Engineers, universities, labor unions and etc. in order to support obtaining qualifications and building networks outside the companies.

The authors wish this thesis would contribute to long term employment for foreign civil engineers in Japanese construction companies.

References

[1] National Institute of Population and Social Security Research. "Japan's Future Population Projections." [Online]. Available: https://www.ipss.go.jp/pp-zenkoku/j/zenkoku2017/pp_zenkoku2017.asp

[2] "Materials for the first meeting of the Social Security Council's Pension Subcommittee on Economic Assumptions in Pension Finance, July, 2017." [Online]. Available: https://www.mhlw.go.jp/file/05-Shingikai-12601000-Seisakutoukatsukan-Sanjikanshitsu_Shakaihoshoutantou/0000173087.pdf

[3] "The first Construction Worker Safety and Health Promotion Expert Council held by Ministry of Land, Infrastructure, Transport and Tourism in Japan 'Current status of the construction industry and construction workers' April. 2017." [Online]. Available: https://www.mlit.go.jp/totikensangyo/const/totikensangyo_const_tk2_000100.html

[4] M. Hashimoto and K. Ozawa, "A study on multilayer structure of subcontractors," in *The 32nd Research Presentations and Discussion Lectures on Construction Management Issues*, December 2014

[5] Central Construction Industry Council under Ministry of Land, Infrastructure, Transport and Tourism. "Tackle on Improvement of the Multilayer Structure of Subcontractors." [Online]. Available: https://www.mlit.go.jp/common/001236203.pdf

[6] National Tax Agency of Japanese Government. "Result of the survey on private sector wages year 2022," [Online]. Available: https://www.nta.go.jp/publication/statistics/kokuzeicho/minkan2022/minkan.htm

[7] Ministry of Land, Infrastructure, Transport and Tourism. "Public Works Bidding Qualification System." [Online]. Available: https://www.mlit.go.jp/common/001089821.pdf

[8] Japanese Government. "Infrastructure system overseas expansion strategy 2025 (revision 2021)." [Online]. Available: https://www.kantei.go.jp/jp/singi/keikyou/pdf/infra2025.pdf

[9] Small and Medium Enterprise Agency. "White Paper on Small and Medium Enterprises fiscal year 2021." [Online]. Available: https://www.chusho.meti.go.jp/pamflet/hakusyo/2021/PDF/chusho.html

[10] E. L. Deci and R. Flaste, *Why We Do What We Do—The Dynamics of Personal Autonomy*. Penguin, 1995. [Online]. Available: http://www.clem.co.jp/wp-content/uploads/seminar/IOD-20150228-ikebe-Deci-%e4%ba%ba%e3%82%92%e4%bc%b8%e3%81%b0%e3%81%99%e5%8a%9b-V21.pdf

[11] T. Parsons, *Theories of Society; Foundations of Modern Sociological Theory*. Free Press of Glencoe, 1961

[12] C. I. Barnard, *The Functions of the Executive*. Harvard University Press, 1938

[13] A. H. Maslow, *Motivation and Personality*. Harper & Row，1954

[14] T. Watanabe, H. Ninomiya, and L. Wang, "Fundamental study on work motivation of employees in local construction companies," *Journal of the Japan Society of Civil Engineer*, vol. 75, no. 2, 2019.
[15] H. Ninomiya and T. Watanabe, "Evaluation method for work motivation of construction engineers using organismic integration theoty," *Journal of the Japan Society of Civil Engineer*, vol. 78, no. 2, 2022.
[16] H. Ninomiya and T. Watanabe, "Analytical study of the transition process of work monivation in construction engineers using the life story method," *Journal of the Japan Society of Civil Engineer*, vol. 79, no. 3, 2023.
[17] K. Sonoda, "The effects of japanese employment systems on attitudes toward employing foreign workers," *Transactions of the Academic Association for Organizational Science*, vol. 8, no. 1, pp. 64-69, 2019.
[18] Y. Murakami, "Employment of foreign scientists and engineers in Japan," *Japan Society for Research Policy and Innovation Management*, vol. 21, no. 3/4, 2006.
[19] T. Ide, "Economic analysis of the local construction industry, issues on qualification system and human resource development based on business review and skilled worker questionnaire survey," *Seikei University Economics and Business Review*, vol. 52, no. 2, Dec. 2021.
[20] Y. Yoshiowa, "Experiences of education for foreign engineers," Japanese Society for Engineering Education, 2009.
[21] H. Sugimoto, D. A. Kumar, and K. Aihara, "An experimental study on business model of overseas employment promotion in small companies," Japan Society for Management Information, 2008, [Online]. Available: https://www.jstage.jst.go.jp/article/jasmin/2008f/0/2008f_0_71/_article/-char/ja/
[22] G. Goktug, "Working in a Japanese company as a foreign engineer—Similarities & differences for foreign engineers in Japan," *The Japan Society of Mechanical Engineers Journal*, vol. 101, 1998.
[23] M. Ito, "Present situation of foreign engineer in Japan," *The Japan Society of Mechanical Engineers Journal*, vol. 101, 1998.
[24] Motoya Takagi, Takuro Shoji, Lu Jian, "Research on occupational accident prevention of foreign workers in the construction industry," Japan Society for Safety Engineering Journal, Vol. 13, no. 2, 2020.
[25] M. Takagi, T. Shoji, L. Jian, S. Era, and H. Kanisawa, "Occupational safety and health issues of foreign workers in the construction industry, general contractor survey concerning foreign technical interns," *Japan Society for Safety Engineering Journal*, vol. 57, no. 3, 2018.
[26] P. Chhour and Y. Harada, "Policy evaluation of technical intern training program: A perspective from Cambodia," *Hosei University Public Policy Shirin Journal*, 2019.
[27] Fujitsu Research Institute, "A practical manual for utilizing highly skilled foreign human resources, for those who are considering hiring and sustainable employment," Ministry of Health, Labor and Welfare commissioned project, March 2014, [Online]. Available: https://jsite.mhlw.go.jp/hokkaido-roudoukyoku/var/rev0/0131/9773/2014612163123.pdf
[28] K. Hayakawa, "A study on the possibility of passing on high skills to foreign resident workers in the small and medium-sized manufacturing industry, focusing on Japanese Brazilian workers in Hamamatsu City," *Japanese Journal of Business Ethics*, vol. 29, 2022.
[29] K. Abe, H. Kaneko, and M. Fujiwara, "Study on foreign workers' issues in Japan," *Construction Management Research Papers*, vol. 3, 1995.
[30] H. Komai, *Live Together with Immigrant Workers*. Akashi Bookstore, Sept. 1992.
[31] Chieko Kamibayashi, "Labor Shortage and Migrant Workers: Introduction to the Special Issue, Case study on Construction industry, Nursing care service industry, Agriculture industry," Journal of Ohara Institute for Social Research, July 2019
[32] A. Kitanaka, "Latest comparison between technical intern trainee and specific skilled worker no. 1 class," Myanmar Unity Co., Ltd, Jun. 2022, [Online]. Available: https://www.myanmarunity.jp/support/1152/#:~:text=%E6%8A%80%E8%83%BD%E5%AE%9F%E7%BF%92%E3%81%AF%E6%9C%80%E9%95%B75%E5%B9%B4%E3%81%A7%E3%81%99%E3%80%82,%E7%89%B9%E5%AE%9A%E6%8A%80%E8%83%BD%E3%81%8C%E8%A8%B1%E5%8F%AF%E3%81%95%E3%82%8C%E3%81%A6%E3%81%84%E3%82%8B%E8%81%B7%E7%A8%AE%E3%81%AB%E3%81%8A%E3%81%84%E3%81%A6%E3%81%AF%E3%80%81%E6%8A%80%E8%83%BD%E5%AE%9F%E7%BF%92%E3%82%923%E5%B9%B4%E7%B5%8C%E3%82%8C%E3%81%B0%E3%80%81%E7%84%A1%E8%A9%A6%E9%A8%93%E3%81%A7%E7%89%B9%E5%AE%9A%E6%8A%80%E8%83%BD1%E5%8F%B7%E3%81%AB%E7%A7%BB%E8%A1%8C%E3%81%A7%E3%81%8D%E3%81%BE%E3%81%99%E3%81%AE%E3%81%A7%E3%80%81%E7%89%B9%E5%AE%9A%E6%8A%80%E8%83%BD1%E5%8F%B7%E3%81%A75%E5%B9%B4%E5%83%8D%E3%81%91%E3%81%A6%E3%80%81%E5%90%88%E8%A8%888%E5%B9%B4%E5%83%8D%E3%81%91%E3%81%BE%E3%81%99%E3%80%82
[33] R. Masuyama and K. Ozawa, "Good practices by enterprises accepting foreign skilled workers in Japanese construction industry," in *The 41st Construction Management Research Presentations and Discussions Papers*, Dec. 2023.
[34] K. Sano, "Shift from Japanese model to Korean model on foreign works policy, mainly evaluation of the Korean "Employment Permission System" for foreign workers," *Journal of the Center for Regional Affairs, Fukushima University*, vol. 22, no. 1, Sept. 2010.

[35] K. Sano, "the present conditions of the Korean "Employment Permission System" and foreign workers, suggestions for Japan's foreign worker acceptance policy," *Journal of the Center for Regional Affairs, Fukushima University*, vol. 26, no. 1, Sep. 2014.
[36] K. Sano, "Implications of the Korean "Employment Permission System" to Japan," *Journal of Japan Finance Corporation*, vol. 36, Aug. 2017.
[37] Y. Takayasu, "Why South Korea's foreign worker acceptance program has been so successful," *Business Journal*, May 2018, [Online]. Available: https://biz-journal.jp/company/post_23518.html
[38] Ministry of Health, Labor and Welfare, "Regarding reporting status of foreign employment status," 2023, [Online]. Available: https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/koyou_roudou/koyou/gaikokujin/gaikokujin-koyou/06.html
[39] Ministry of Health, Labor and Welfare, "Current issues on foreign technical intern training program," March 2018, [Online]. Available: https://www.meti.go.jp/policy/mono_info_service/mono/fiber/ginoujisshukyougikai/180323/3_mhlw-genjyoukadai.pdf
[40] Ministry of Foreign Affairs of Japan, "Overview of the residence status: Specific skills qualification," Ministry of Foreign Affairs of Japan, 2024, [Online]. Available: https://www.mofa.go.jp/mofaj/ca/fna/ssw/jp/overview/
[41] Immigration Services Agency, "Specific skills qualification," 2019, [Online]. Available: https://www.moj.go.jp/isa/content/930004039.pdf
[42] Ministry of Justice, "Basic policy on operation of the residence status of specific skills qualification system," 2024, [Online]. Available: https://www.moj.go.jp/isa/content/001416434.pdf, [Online]. Available: https://www.moj.go.jp/isa/content/930003797.pdf
[43] Japan International Trainee & Skilled Worker Cooperation Organization, "What is a "Specified Skilled Worker" Residency Status?," 2019, [Online]. Available: https://www.jitco.or.jp/ja/skill/
[44] Ministry of Land, Infrastructure, Transport and Tourism, "Application and Claims Guide for Business Review," April 2024, [Online]. Available: https://www.ktr.mlit.go.jp/ktr_content/content/000847134.pdf
[45] Ministry of Land, Infrastructure, Transport and Tourism, "Proposal for implementation policy of bidding, contract and comprehensive evaluation fiscal year 2021," March 2021, [Online]. Available: https://www.ktr.mlit.go.jp/ktr_content/content/000798863.pdf
[46] Ministry of Land, Infrastructure, Transport and Tourism, "Overseas Infrastructure Project Engineer Certification and Award System," March 2024, [Online]. Available: https://www1.mlit.go.jp/report/press/content/001729401.pdf
[47] Ministry of Health, Labor and Welfare, "Skill training supplementary materials," homepage of Ministry of Health, Labor and Welfare, 2024, [Online]. Available: https://www.mhlw.go.jp/stf/newpage_11114.html
[48] Ministry of Health, Labor and Welfare, "List of registered training institutions," Ministry of Health, Labor and Welfare, 2024, [Online]. Available: https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/koyou_roudou/roudoukijun/anzen/anzeneisei05.html
[49] S. Hamada, K. Kaito, E. Sugihara, and D. Mizutani, "Hollowing-out and progress of construction element technology of prime contractors," *Journal of the Japan Society of Civil Engineer F4*, vol. 77, no. 1, 2021.
[50] Japan Educational Exchanges and Services, "Japanese-Language Proficiency Test," 2024, [Online]. Available: https://www.jlpt.jp/about/levelsummary.html
[51] H. Ichinose and T. Goso, "Current condition of the Japanese construction market, contract management, and construction management education in three ASEAN universities," *Engineering Journal*, vol. 26, no. 3, 2022.
[52] R. Kasai, T. Goso, M. Akiyama, and H. Kato, "Development of automated system for classifying productivity behavior of construction workers using deep learning," *Engineering Journal*, vol. 28, no. 10, 2024.

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