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# Current Condition of the Japanese Construction Market, Contract Management, and Construction Management Education in Three ASEAN Universities

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**Abstract.** This paper reports on a basic study on the current condition of the Japanese construction market, the third largest market in the world, and contract management in Japan. It also deals with the current condition of construction management education, which is the basis for contract management in Japan and three ASEAN countries namely, Indonesia, Singapore, and Thailand. The Japanese construction market is introduced in terms of its scale and overseas expansion of leading Japanese construction companies. The characteristics of the Japanese construction market and a survey on Japanese construction management education are introduced. The curriculums of construction management education in three ASEAN universities are surveyed. Finally, by comparing the three ASEAN universities and Japan horizontally and internationally, the current condition of construction management education in civil engineering is obtained. The outcome deepens understanding of access to each construction market and can be the first step toward construction business collaboration between Japanese and some ASEAN countries.

**Keywords:** Japanese construction market, contract management, construction management education.

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## 1. Introduction

The hypothesis of this paper is construction management education in Japan might be vulnerable because Japanese construction market works without strict contract management. To confirm this, first, this paper deals with Japanese construction market to confirm its characteristic.

Survey of syllabuses on Japanese construction management education was done based on a table which exhaustively considered on contents of construction management to the vulnerability of the construction management education in Japan.

Finally, survey of the construction management education curriculums in three ASEAN universities was done to make the vulnerability above clear by country-by-country comparison.

## 2. Japanese Construction Market

### 2.1. Scale of the Japanese Construction Market

According to statistics by the United Nation (UN) [1], the scale of the construction market worldwide as of 2018 is approximately 4.8 trillion US\$, as presented in Table 1. The Japanese construction market accounts for about 280 billion US\$, which is the third largest market in the world as shown in Fig. 1. The ratio of the construction market to the total value added (TVA) (Const/TVA) for Japan is 5.6%. According to a 2017 publication of the Asian Development Bank (ADB), “Developing Asia will need to invest \$1.7 trillion per year in infrastructure until 2030 to maintain its growth momentum, tackle poverty, and respond to climate change” [2]. The Japanese ratio is lower compared with those of other Asian countries such as China (6.9%), India (8.0%), and Indonesia (11.0%). Although the Japanese construction market is large, it cannot be described as a matured market. In addition, the number of workers and licensed contractors in the Japanese construction market as of 2018 is approximately 5.03 million and 468 thousand, respectively [3].

### 2.2. Overseas Expansion of Leading Japanese Construction Companies

The Overseas Construction Association of Japan, Inc (OCAJI) announced changes in international revenue for the leading Japanese construction companies from 1989 to 2018 [4]. It showed the occurrence of two peaks in 1996 and 2007, and the revenue was over 14 billion US\$ in both years. Furthermore, in the 2018 fiscal year, the revenue was more than those peaks at approximately 17 billion US\$. Note that the applied exchange rate based on statistics by the UN is 1US\$=110.42JPY (Japanese YEN, in 2018 fiscal year).

Table 1. Top 20 world construction market (US\$).

No.	Country/Area	Construction	%	Const/ TVA
1	China	934,226,119,412.64	19.5%	6.9%
2	United States	839,100,000,000.00	17.5%	4.1%
3	Japan	275,528,940,411.36	5.8%	5.6%
4	India	201,218,711,386.63	4.2%	8.0%
5	Germany	180,488,820,596.86	3.8%	5.1%
6	United Kingdom	154,723,640,727.26	3.2%	6.1%
7	France	138,661,773,768.63	2.9%	5.6%
8	Canada	125,405,643,500.95	2.6%	7.9%
9	Russian Federation	121,201,259,410.53	2.5%	8.2%
10	Australia	111,826,506,538.63	2.3%	8.3%
11	Indonesia	109,735,458,222.94	2.3%	11.0%
12	Republic of Korea	93,004,045,676.85	1.9%	5.9%
13	Brazil	92,583,002,764.00	1.9%	5.8%
14	Mexico	88,965,776,192.15	1.9%	7.7%
15	Spain	79,988,410,858.04	1.7%	6.2%
16	Italy	78,881,029,814.20	1.6%	2.0%
17	Turkey	55,318,767,732.50	1.2%	8.0%
18	Saudi Arabia	40,251,659,332.80	0.8%	5.1%
19	Netherlands	39,467,499,717.65	0.8%	4.8%
20	Poland	39,390,409,915.88	0.8%	7.7%
21	Others	987,994,145,588.38	20.6%	6.1%
<b>Total</b>		<b>4,787,961,621,568.87</b>	<b>100.0%</b>	<b>5.8%</b>

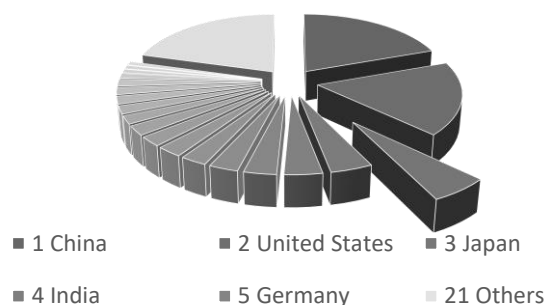


Fig. 1. Top 20 world construction market (US\$).

Table 2 lists the international revenue of the top contractors in the world based on ENR [5]). The IR ratio is a ratio of the international revenue to the total revenue of each contractor. The five leading Japanese (large-scale) construction companies are extracted from the table, and the average international revenue of these companies is approximately 2 billion US\$. The average international revenue of the top 10 companies is approximately 20 billion US\$. The average IR ratio of the five large-scale Japanese construction companies is approximately 20%, with is approximately 60% that of the top 10 companies. Although Japanese construction companies are gradually expanding their overseas market, they are still largely dependent on the Japanese construction market.

Table 2. International revenue of top contractors in the world (US\$ Mil).

RANK	FIRM	CTRY	REVENUE		IR ratio a/b
			INT'L a	TOTAL b	
1	ACS	SPAIN	38,041	44,188	86%
2	HOCHTIEF	GERMANY	27,797	29,121	95%
3	CHINA COMMUNICATIONS CONSTRUCTION GROUP	CHINA	22,727	83,278	27%
4	VINCI	FRANCE	22,207	52,139	43%
5	STRABAG	AUSTRIA	15,779	18,689	84%
6	BOUYGUES	FRANCE	15,582	32,023	49%
7	POWER CONSTRUCTION CORP. OF CHINA	CHINA	13,775	52,983	26%
8	SKANSKA	SWEDEN	13,583	17,124	79%
9	CHINA STATE CONSTRUCTION ENGINEERING	CHINA	12,813	170,435	8%
10	FERROVIAL	SPAIN	11,892	15,288	78%
Average of Top10			19,420	51,527	58%
30	OBAYASHI	JAPAN	4,213	17,529	24%
36	KAJIMA	JAPAN	3,734	15,987	23%
66	PENTA-OCEAN	JAPAN	1,464	4,660	31%
72	TAKENAKA	JAPAN	1,271	11,188	11%
82	SHIMIZU	JAPAN	1,033	13,504	8%
157	TAISEI	JAPAN	350	13,756	3%
Average of JPN Contractors			2,011	12,771	17%

### 2.3. Previous Research

There are various reports on the construction markets in different countries. Hariharan et al. [6] pointed out the size, features, and problems of Indian construction market. Weisheng et al. [7] analyzed the Chinese construction market through construction professional services (CPSs). Maemura et al. [8] extracted the problems of international construction projects in Vietnam using qualitative analyses.

The importance and challenges of contract management have been widely reported in the literature. Edwin et al. [9] pointed out that “cultural clashes and inappropriate contract arrangements were the two most important factors contributing to disputes in international projects.” Toor and Ogunlana [10] identified a total of 75 problems causing delays such as lack of resources, design delays, planning and scheduling deficiencies, processing change orders, and contract management in a specific project in Asia. Gui et al. [11] considered contract management as one of the 11 major underlying

dimensions that generate reworks in the Chinese construction market.

Not so many papers addressed construction management education, which is important for the construction industry. However, according to Chitkara [12], “the construction industry accounts for 6–9% of the GDP in many countries; thus, it strongly affects various economic, social, educational, and vocational sectors.” Jeffrey Russell et al. [13] also pointed out the importance of construction management education. Youngcheol et al. [14] noted that “the results contribute to the prioritization of the CM (Construction Management) functions that are most urgent for the Cambodia construction industry, and this information can be used to develop customized CM education programs.” The demand for construction management education from the developed to the developing countries has been huge for many years. However, the fact that the papers about construction management education is small in volume, leads to lack of substantiated theoretical basis for the issue of construction management education. For example, Tatum [15] dealt the importance of balancing engineering and management in construction education. Chinowsky et al. [16] dealt a genealogical approach, the historical research of the construction engineering management (CEM). Fisher et al. [17] dealt how to improve an organization’s core competency in construction project management. But a common feature of these papers dealt with construction management education is no paper has provided theoretical basis for the issue of construction management education.

### 3. Construction Management in the Japanese Construction Market

The Japanese construction market has an outstanding characteristic in terms of the very small number of construction disputes. According to Omoto et al. [18], “the number of construction disputes in England and the United States of America are about ten times more than it is in Japan”. This is because “in the Japanese public works construction contract (Standard Form of Agreement and General Conditions of Government Contract Works of Building and Civil Engineering Construction, GCW), the employer supervises and certifies the contractor’s works”. The result of this is as follows:

Assessment of additional payment and the adjustment of time for completion are to be made by the employer.

The contractor has no obligation to prove his loss or damages and excusable delay.

An efficient contract is achieved if the employer can assess variations and any other claims, and there is mutual trust between the parties.

As a contractor has no obligation to prove his loss or damages and excusable delay, only “the sum of the total cost and the final time for completion” are ‘the sole variables in project management’ contract in the Japanese construction market. In other words, contract management, which is complicated and very naturally

executed in other construction markets, is not executed in the Japanese construction market.

This is because the operation method of contract is inflexible owing to the Japanese local autonomy act and the public accounting act. This does not mean that the acts are problematic. Rather, after Japan's defeat in World War II, the country was forced to provide huge infrastructure from scratch within a short period. To save time, that is, to deter disputes, it seems that the complicated contract management, which is required "to show the progress of the works", was avoided and the aforementioned operation method of contract was consequently adopted. Goso et al. [19] pointed out empirically that the awareness of contract management "to show the progress of the works" in the Japanese construction market is remarkably lower than in the American construction market.

However, in general, the contractor has the obligation to prove his loss or damages and excusable delay in the international construction market. Hence, this section first sets out the view of contract management in the international construction market.

Kusayanagi [20] indicated that two types of analyses are required to handle disputes related to contracts: the first is a qualitative analysis that evaluates what type of contractual right exists in contrast to the event and the conditions of the contract, and the second is a quantitative analysis that examines by how much the time and cost will be changed by the event, that is, to clearly determine the change in quantity as a result of the event. The aim of contract management is to deliver a project in accordance with contract and resolve disputes. To achieve this, it is essential to quantify the issues of the dispute. Quantification means to deal with contract management based on a three-piece set of "Construction plan, Bill of quantities, and Construction programme (time schedule)" [21]. In other words, it is important to view contract management as part of the entire construction management "to show the progress of the works", the system-integrated management with cost program, and contract managements.

Furthermore, a survey carried out in Japan from November 2007 to January 2009 by Goso et al. [16] yielded the following findings:

Variations of conditions of contract and additional works have occurred in most of the projects.

In terms of the question of whether additional costs were claimed at over 80% of the projects, 64% of the respondents from construction companies answered in the affirmative, whereas 33% of ordering organizations gave the same answer, resulting in a difference of over 30% between the two parties.

On the question of whether claims of the extension of time and additional costs have been reasonably treated at over 80% of the projects, 18% of the respondents from construction companies answered in the affirmative, whereas 71% of ordering organizations gave the same answer with a large perception gap existing between them.

This clearly shows that Japanese contractors are beginning to feel a sense of victimization. To correct this

view, transparency will be important. To achieve transparency, the requirement "to show the progress of the works", which is standard in international construction market, should be effective. From this point of view, contract management in the Japanese construction market is also expected to be harmonized with that of the international construction market in the future. Liberalization of government procurement by the World Trade Organization (WTO) will boost this trend.

However, construction management education is essential for further harmonization because it is a basis for this harmonization.

#### **4. Survey on Construction Management Education in Japan and Three ASEAN Universities**

In the preceding section, we noted that it is essential for management "to show the progress of the works" and to consider contract management as part of the entire construction management.

This section sets out the result of a survey that investigated construction management education in Japan.

##### **4.1. Survey of Syllabuses on Japanese Construction Management Education**

The survey first investigated how construction management, which is essential for contract management, is taught in Japanese universities with civil engineering faculties:

In 2004, Kusayanagi [22] exhaustively discussed the question of what contents of construction management should be taught in universities and proposed a table known as "Structure of Construction Management Education Program" [23] with application to international construction projects in mind.

Table 3 shows that result of the applicable syllabuses by the instructors/teachers of civil engineering faculties in Japanese universities in line with the table proposed by Kusayanagi.

The survey covered '122 faculties of universities and 30 technical colleges in 2018, and "209 faculties of universities, 6 junior colleges, and 30 technical colleges" in 2004. It should be noted that the data for the instructors/teachers were obtained from "Zenoku Doboku-kei Kyoukan/Kyouin Meibo, 2018" (Japan Society of Civil Engineers (JSCE)), which is a name list of instructors/teachers in the civil engineering faculties of Japanese universities, whereas the syllabuses were obtained from the internet in 2019.

This resulted in the following:

As of 2018, the number of instructors/teachers with the capacity to give lectures on construction management was approximately 60. Since the number in 2004 was approximately 30, the number had doubled between 2004 and 2018. Additionally, the number of instructors/teachers whose names appeared in both 2004 and 2018 was approximately 10.

Table 3. Survey of syllabuses on Japanese construction management education based on the structure of construction management education program.

The coverage of the survey: ‘122 faculties of universities, and 30 technical colleges’ in 2018, and “209 faculties of universities, 6 junior colleges, and 30 technical colleges” in 2004 (“Zenkoku Doboku-kei Kyoukan/Kyouin Meibo, 2018” (Japan Society of Civil Engineers (JSCE))		Tokyo City University	Osaka University	Hokkaido University	Nihon University	Koichi University of Technology	Kanamoto University	Tokushima University	Kobe University	Tokohi University	Aichi Institute of Technology	Institute of Technologists	Yamaguchi University	Tokyo University of Science	Nagoya Institute of Technology	Yamaguchi University	Kyushu University	National University	Toyo University	Utsunomiya University	Kyoto University	Tokyo Institute of Technology	Ashikaga University	Amuro Institute of Technology	Kanazawa Institute of Technology	Kansai University	Meijo University	Total											
<b>1. Planning &amp; assessment of Infrastructure development</b>																																							
1.1. Infrastructure development in the world	a Infrastructure development	1	0										0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
	b International Construction Industry	1	0																																			5	
	c Globalization, regulations, standards	1	0														1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	
1.2. Infrastructure development in Japan	a Realities of Infrastructure development	1	0											1	1	1	0	0	1	0	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	1	13	
	b Situation of Construction Industry	1	0																				2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	10	
	c Mission of Construction Industry	1	0														1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	
1.3. Planning & Assessment of Infrastructure development	a Mission & Policy	1	1																																			1	14
	b Grand Design & Master Planning	0	0																																			4	
	c District & Regional Planning	0	0																																			10	
	d F/S, Feasibility Studies	0	0																																			11	
1.4. Environmental Management	a Environmental Issues	0	1																																			10	
	b Environmental Resarch	0	1																																			9	
1.5. Role of Civil Engineers	a Engineer’s Mission	1	0																																			4	
	b Engineer’s Essics	1	0																																			12	
<b>2. Project mission management</b>																																							
2.1. Law & Regulations related project execution	a Construction Law, Audit	1	0																			1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	5	
	b Environmental laws & regulations	0	0																																				1
	c Other related laws & regulations	0	0																																				4
2.2. Standard conditions of construction contract (SCCC)	a Japanese SCCC	1	0																																			3	
	b International SCCC	2	0																																			3	
	c CM SCCC	1	0																																			1	
2.3. Feasibility Study Project Appraisal	a Risk evaluation & management	1	0																																			9	
	b Detail environmental assessment	0	0																																			3	
	c Feasibility study assessment	0	0																																			2	
2.4. Project mission planning	a Project formation	2	0																																			8	
	b Basic design & Construction plan	1	0																																			3	
	c Estimation & Budgeting	2	0																																			8	
	d Financial planning	1	0																																			6	
2.5. Procurement & Contract	a Project mission Organization	3	0																																			8	
	b Contract formation	3	0																																			8	
	c Tendering, evaluation & contract	3	0																																			10	
<b>3. Project execution management</b>																																							
3.1. Project administration	a Security, External affairs	1	0																																			1	
	b Tax & accounting	2	0																																			3	
	c Financial control	3	0																																			9	
	d Personnel control	1	0																																			6	
3.2. Project management	a Schedule control	3	0																																			13	
	b Cost control	3	0																																			11	
	c Contract administration	3	0																																			8	
	d Quality management	2	0																																			6	
<b>4. Project field management</b>																																							
4.1. Field work execution plan	a Permanent works	0	0																																			3	
	b Temporary works	0	0																																			2	
	c Equipment	0	0																																			3	
	d Materials	1	0																																			4	
4.2. Field control	a Safety control	1	0																																			2	
	b Quality control	2	0																																			5	
	c Productivity improvement	2	0																																			5	
<b>5. Project Operation &amp; Maintenance</b>																																							
5.1. Project operation	a Operation organization	1	0																																			4	
	b Financial control	1	0																																			3	
5.2. Project maintenance	a Monitoring & investigation	0	1																																			9	
	b Maintenance, repair & renewal	0	1																																			7	
5.3. Project assessment	a Social impacts	0	0																																			1	
	b Problem analysis, etc.	0	0																																			0	
Total		56	5	0	30	30	19	2	13	13	4	8	4	7	10	12	17	0	1	23	7	7	2	8	13	0	0	11	302										

The syllabuses were not confirmed on the HP.



There are two main views to provide lectures on construction management in Japan: a practical perspective and a perspective from Project Management (the Project Management Body of Knowledge, PMBOK).

In terms of the contents of the syllabuses, two large items, “1. Planning & assessment of Infrastructure development” and “2. Project mission management”, account for approximately 65%. This means that the contents are biased toward governmental agencies and/or ordering organizations.

The average number of lectures per instructor/teacher was 5.2 based on the 51 courses in Table 3. The highest number of instructor/ teacher who gives lectures on contract management per university was 3. In general, almost all Japanese universities partially addressed construction management in their respective syllabuses.

If we define exhaustive construction management education as 35 courses out of the 51 courses in Table. 3, approximately 70% were in one lecture the lecture was provided by only one university [24], that is for working people, industry practitioners, only.

However, in terms of the program for working people, the National Graduate Institute for Policy Studies (GRIPS) has been offering an enterprising program [25] since 2018.

The program consists of 50 lectures, each lecture lasting for 1.5 hours, with a total of 75 hours executed in 10 working days. However, a standard course in Japanese universities has 15 lectures with each lecture lasting 1.5 hours for a total of 22.5 hours.

#### 4.2. Survey of the Construction Management Education Curriculums in Three ASEAN Universities

A survey was used to horizontally and internationally investigate the curriculum of construction management education in three ASEAN universities to better understand the condition of construction management education in civil engineering:

The survey covered three ASEAN universities with civil engineering faculty whose curriculums were disclosed on the internet.

The survey extracted one university each from three countries: Indonesia, Thailand, and Singapore.

For each of these three countries, one of the best universities was extracted based on the ‘QS World University Rankings 2019 [26] as follows: Institut Teknologi Bandung (ITB) [27], Chulalongkorn University (CU) [28], and National University of Singapore (NUS) [29].

The result is presented in Table 4 and discussed as follows:

The ratio of the construction management education courses to all the courses in civil engineering faculties was almost 10% in ITB and CU, and just under 20% in NUS.

In all the three universities, the ratios of construction management education are higher in masters and doctoral courses than in undergraduate courses. Thus, there is a

trend of intensive construction management education lectures offered in masters and doctoral programs.

The ratio of construction management education in masters and doctoral course is just under 30%, particularly in NUS.

#### 4.3. Comparison of Construction Management Education in Three ASEAN Universities and Japanese Universities

To clarify the differences in the contents of the construction management education, the three ASEAN universities and Japanese universities were compared.

The result is presented in Table 5 and discussed as follows:

The ratio of construction management education is different for each country. This could be due to the differences in the construction market in each commercial practice, thereby significantly affecting construction management education.

Furthermore, construction investment, population, and construction investment per capita are indicated in the lower part of Table 5. It seemed that there is no clear correlation between such values and the distribution ratios.

However, in NUS, the distribution ratio of “4. Project field management” is higher than others at 30%. There is a possibility that this is influenced by the fact that Singapore is a common law country. As previously mentioned, “the number of construction disputes in England and the United States of America are approximately ten times higher than that in Japan”. English law is the common law legal system in England and Wales. During construction disputes, substances or the things that have occurred are considered important. To analyze such substances, knowledge of “Project field management” is very essential. Hence, this could be the reason the curriculum of NUS is richer in the section on “Project field management”.

In terms of the contents of lectures in Japanese universities, two major items, namely, “1. Planning & assessment of Infrastructure development” and “2. Project mission management” account for approximately 65%, as previously mentioned. This means that the contents are biased toward governmental agencies and/or ordering organizations. However, for the three ASEAN universities (ITB, CU, NUS), two other items, namely, “Project execution management” and “Project field management” account for 40%, 50%, and 45% respectively, whereas they account for only 27% in Japanese universities. These two items favor construction companies and contractors. Hence, the curriculums of the three ASEAN universities are better balanced than the curriculum of Japanese universities because basic construction contract is a two-party contract. Further, the result of Japanese universities is aggregated result of all Japanese universities which deal with civil engineering in 2018. However, the three ASEAN universities are individual. Even aggregated syllabus, construction management education in Japan is less balanced than each

three university. This fact elucidates the hypothesis of this paper, the construction management education in Japan might be vulnerable.

There was also no clear tendency of construction management education in terms of construction investment per capita (Const. Invt. PC, US\$/psn).

Though demand of infrastructure should have something to do with construction management education, it might be that Const. Invt. PC does not have direct relation with construction management education.

There was also no clear tendency of construction management education in terms of legal system (Civil law vs Common law). This is interesting result because legal system should have seemingly strong impact on contract management education required for contract management. It might be that each business practice in detail is more important than each legal system.

Table 4. Comparison of the ratio of construction management education courses and all the courses in civil engineering faculty in three ASEAN universities.

The number of courses	Institut Teknologi Bandung (ITB)			Chulalongkorn University (CU)			National University of Singapore (NUS)		
	All	CM	Ratio	All	CM	Ratio	All	CM	Ratio
	a	b	b/a	a	b	b/a	a	b	b/a
Undergraduate Program	33	2	6.1%	40	4	10.0%	104	13	12.5%
Master/Doctor Program	18	3	16.7%	106	14	13.2%	52	15	28.8%
Total	51	5	9.8%	146	18	12.3%	156	28	17.9%

Table 5. Comparison of the distribution ratios of construction management education in the three ASEAN universities and Japanese universities.

	Jpn's Univ.		Institut Teknologi Bandung (ITB)		Chulalongkorn University (CU)		National University of Singapore (NUS)	
	Lectures	%	Lectures	%	Lectures	%	Lectures	%
1. Planning & assessment of infrastructure development	115	38%	0	0%	4	22%	6	30%
2. Project mission management	82	27%	2	40%	4	22%	4	20%
3. Project execution management	57	19%	1	20%	6	33%	3	15%
4. Project field management	24	8%	1	20%	3	17%	6	30%
5. Project operation & maintenance	24	8%	1	20%	1	6%	1	5%
Total	302	100%	5	100%	18	100%	20	100%
Name of Country	Japan		Indonesia		Thailand		Singapore	
Const. Invt.(US\$)	275,528,940,411		109,735,458,223		12,742,188,906		12,067,539,432	
Population (k)	126,860		208,615		62,299		3,955	
Const. Invt. PC (US\$/psn)	2,171.9		526.0		204.5		3,051.4	
Legal system			Civil law				Common law	

## 5. Conclusion

In this paper, the trends of the Japanese construction market and construction companies were analyzed in terms of the international construction market. In particular, we demonstrated that in contract management, the idea of management “to show the progress of the

works” is not common in Japan, whereas it is common in the international construction market.

Next, in view of the importance of treating contract management as part of construction management, the current condition of construction management education in Japan was evaluated through a survey of syllabuses in Japanese universities. Finally, horizontal and international

comparison was performed using three ASEAN universities to better understand the condition of construction management education in civil engineering.

Through those analyses, the hypothesis of this paper, the construction management education in Japan might be vulnerable, was made clear.

This paper can contribute to the persons who are planning to enter Japanese construction market and teachers of construction management who should plan their syllabuses to enhance effective contract management.

## References

- [1] United Nations (UN). "National accounts—Analysis of main aggregates (AMA)." <https://unstats.un.org/unsd/snaama/Basic> (accessed Mar. 21, 2021).
- [2] Asian Development Bank (ADB). "Meeting Asia's infrastructure needs, 2017." <https://www.adb.org/publications/asia-infrastructure-needs> (accessed Mar. 21, 2021).
- [3] Japan Federation of Construction Contractors, *Handbook of Construction Industry 2019* (in Japanese). [Online]. Available: [https://www.nikkenren.com/publication/pdf/handbook/2019/2019\\_04.pdf](https://www.nikkenren.com/publication/pdf/handbook/2019/2019_04.pdf) (accessed Mar. 21, 2021).
- [4] The Overseas Construction Association of Japan, Inc. (OCAJI). "Changes of international revenue" (in Japanese). [https://www.ocaji.or.jp/overseas\\_contract/](https://www.ocaji.or.jp/overseas_contract/) (accessed Mar. 21, 2021).
- [5] Engineering News-Record (ENR), The Top International Contractors.
- [6] H. Subramanyan, P. H. Sawant, and V. Bhatt, "Construction project risk assessment: Development of model based on investigation of opinion of construction project experts from India," *J. Constr. Eng. Manage.*, vol. 138, no. 3, pp. 409–421, 2012.
- [7] W. Lu, K. Ye, R. Flanagan, and C. Jewell, "Developing construction professional services in the international market: SWOT analysis of China," *J. Manage. Eng.*, vol. 29, no. 3, pp. 302–313, 2013.
- [8] Y. Maemura, E. Kim, and K. Ozawa, "Root causes of recurring contractual conflicts in international construction projects: Five case studies from Vietnam," *J. Constr. Eng. Manage.*, vol. 144, no. 8, p. 05018008, 2018.
- [9] E. H. W. Chan and R. Y. C. Tse, "Cultural considerations in international construction contracts," *J. Constr. Eng. Manage.*, vol. 129, no. 4, pp. 375–381, 2003.
- [10] S. U. R. Toor and S. O. Ogunlana, "Problems causing delays in major construction projects in Thailand," *Constr. Manage. Econ.*, vol. 26, no. 4, pp. 395–408, 2008.
- [11] G. Ye, Z. Jin, B. Xia, and M. Skitmore, "Analyzing causes for reworks in construction projects in China," *J. Manage. Eng.*, vol. 31, no. 6, p. 04014097, 2015.
- [12] K. K. Chitkara, *Construction Project Management, Planning, Scheduling, and Controlling*, 4th ed. New Delhi, India: Tata McGraw-Hill, 2004.
- [13] J. Russell and J. T. P. Yao, "Consensus! Students need more management education," *J. Manage. Eng.*, vol. 12, no. 6, pp. 17–29, 1996.
- [14] Y. Kang, Z. Jin, C. Hyun, and H. Park, "Construction management functions for developing countries: Case of Cambodia," *J. Manage. Eng.*, vol. 34, no. 3, p. 05018004, 2018.
- [15] C. B. Tatum, "Balancing engineering and management in construction education," *J. Manage. Eng.*, vol. 12, no. 6, pp. 17–29, 1987.
- [16] P. S. Chinowsky and J. E. Diekmann, "Construction engineering management educators: History and deteriorating community," *J. Constr. Eng. Manage.*, vol. 130, no. 5, pp. 751–758, 2004.
- [17] D. J. Fisher, L. Schluter, and P. K. Toleti, "Project management education and training process for career development," *J. Constr. Eng. Manage.*, vol. 131, no. 8, pp. 903–910, 2005.
- [18] T. Omoto et al., "Procedure of the dispute resolution in the construction contracts," (in Japanese), *Journal of Construction Management, JSCE*, vol. 9, pp. 151–162, 2002.
- [19] T. Goso et al., "A study on the concrete measure for developing competence of Japanese construction industry in international construction market," (in Japanese), *Journal of Construction Management JSCE*, vol. 15, pp. 249–260, 2008.
- [20] S. Kusayanagi, "Cost control technique for systematization of project management applying to international projects," (in Japanese), *Doboku Gakkai Ronbunshu*, no. 504/VI-25, pp. 137–146, 1994.
- [21] T. Hiromitsu et al., "Accuracy improvement of data collection & analysis of productivity management on construction site," (in Japanese), *Journal of JSCE*, 2011. [Online]. Available: <http://library.jsce.or.jp/jsce/open/00550/2012/18-06-0004.pdf> (accessed Mar. 21, 2021).
- [22] S. Kusayanagi, "To build up the appropriate education program for construction management in Japan," (in Japanese), *Journal of Construction Management, JSCE*, vol. 11, pp. 281–292, 2004.
- [23] S. Kusayanagi, R. Niraula, and Y. Hirota, *Principles and Practice of International Construction Project Management*. Tokyo, Japan: Eiko-sha, 2009.
- [24] T. Goso and M. Minagawa, "Design and practice of graduate program for adult students in the field of construction management," (in Japanese), *JSEE Annual Conference & Exposition*, vol. 67, no. 6, pp. 59–67, 2019.
- [25] The National Graduate Institute for Policy Studies (GRIPS) HP. "Education program for overseas infrastructure development, 2019." (in Japanese). <https://www.grips.ac.jp/jp/seminars/20190614-5933/> (accessed Mar. 2021).
- [26] QS Stars University Ratings. "QS World University Rankings, 2019." QS.



- <https://www.topuniversities.com/university-rankings/world-university-rankings/2019> (accessed Mar. 21, 2021).
- [27] <https://english.ftsl.itb.ac.id/study-programs/civil-engineering/> (accessed Mar. 21, 2021).
- [28] <https://www.eng.chula.ac.th/wp-content/uploads/2017/01/3-Civil-Engineering.pdf> (accessed Mar. 21, 2021).
- [29] [https://www.eng.nus.edu.sg/wp-content/uploads/sites/6/2020/07/Degree-Requirements\\_CVE2020.pdf](https://www.eng.nus.edu.sg/wp-content/uploads/sites/6/2020/07/Degree-Requirements_CVE2020.pdf) (accessed Mar. 21, 2021).



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