

Historical Study on the Development of Construction Management System in Japan

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ABSTRACT: This paper describes the historical study on the development of construction procurement system for public works from the middle age through the modern era to today. Author clarifies the characteristic of the development of procurement and management system as a part of soft technology such as tendering, contracts, and construction managements in modern Japan. The scope of the study also includes the clarification of the historical factors that affected and caused what and how the construction procurement system has been produced. Present issues in Japanese construction industry are stated as a background in the beginning. Then the traditional procurement and management system before modernization is clarified. This will be followed by the study on modernization of construction in the latter half of nineteenth century, and the consideration on the characteristic and factors affected the development of construction procurement system for public works in modern Japan.

BACKGROUND AND PURPOSE OF THE STUDY

Japanese industrial revolution started in 1860s. Japan opened the door to Western countries in the middle of nineteenth century after national isolation which lasted for more than two centuries. Advanced construction technology for infrastructure, railway, harbor, road, bridge, river, and more was rapidly introduced from Western countries, which acted great role in the development of modern construction technology in Japan from nineteenth to twentieth century.

Hard technology was transferred to Japan by means of foreign engineers' instructions and transferred industrial goods as well as actual construction works. On the other hand, development of construction soft technology, such as procurement system of tendering, contracts, and methods of construction managements for public works had different aspects.

The system of construction procurement and management in Japan has been rapidly changing since 1990s and still searching for its efficiency, optimization, and economy in the construction industry. This procurement and management system has been well functioning to accomplish a number of construction public work projects started in 1960's. Those projects began due to rapidly increased investment in construction industry under the high economic growth; the large scale construction projects such as Honshu-Shikoku bridge, the Trans-Tokyo Bay Crossing and motor way networks in 1980s to 90s. Public works also functioned as one of economic stimulations in the latter half of twentieth century.

It is true, however that this procurement and management system has had structural defects against free trade principle, and caused more expensive construction cost comparing to foreign countries. It was pointed out that the Japanese construction market had structural impediment, which imposed severe conditions on foreign companies, and the regulations and barriers had competitiveness being lost in Japanese construction market. Nominated tendering system, commonly used before 1990s also caused loss of competitiveness.

Societal attitude toward the construction industry became criticism after the middle of 1990s due to problems caused by the defects of procurement and management system. This trend was also encouraged by pre-modern aspect of construction industry with a custom of illegal negotiation in tender process. This criticism has become an argument against construction activities itself. Procurement and management system has close relationship with social and political aspects such as governmental policies for infrastructure,

Table 1: Changes of procurement and management system

| Year | Events |
|------------|---|
| 1980s | Criticism of western countries against barriers of Japanese construction market (Kansai Airport, Honshu-Shikoku Bridge) Japan-US construction talks/ Structural impediment of Japanese procurement system |
| 1992 | Review Meeting of Japan-US construction talk Requirement of introduction of advertised competitive bid |
| 1993 | GATT Uruguay Round WTO Agreement on Government Procurement |
| 1994 | Cabinet meeting decision on "Action plan on the improvement of the tender/contract Application of advertised competitive bid for large scale project over \$ 7.2 mill. |
| 1995 | Ministry of Construction issue "Fundamental Policy for Construction Industry principle" |
| After 1998 | Application of various tender system Proposal tendering method Value Engineering tendering method, Performance based tendering system Construction Database (Construction CALS) Investment of Public works tend to decrease |

regulations and laws, business customs, labor conditions, construction firms, also economic, social and cultural influences on the construction industry for public works. A characteristic of development of construction industry is observed much more in soft technology rather than hard one.

The history of construction and the development of construction industry in an area or in a country affect inevitably the development of its procurement and management system, and it is possible to study characteristics of the development of construction industry by examining the development of soft technology, which is important to discuss the direction of procurement and management system in future.

In this paper, author clarifies the characteristic of the development of procurement and management system for public works, mainly through infrastructure projects in Japan, with an expectation of contributing to the discussion of searching for future system. The scope of the study includes the historical factors that affected and caused what and how the development has been produced as well as the process of the development.

Firstly present issues in Japanese construction industry with rapid changes are stated as study background.

Then the traditional procurement and management system in Japanese construction industry before modernization are clarified. This will be followed by the study on modernization of construction in the latter half of nineteenth century, when the concentrate introduction of Western technology through railways construction and other infrastructure public works, which affected traditional systems.

The study also includes the examination of the process of contract and construction management from the view point of communication to clarify the characteristic of Japanese procurement and management system which depends on non- competitiveness and a spirit of mutual trust and cooperation.

RECENT ISSUES OF PUBLIC CONSTRUCTION WORKS

Changes of procurement and management system

Changes in environment of construction public works were a world-wide trend in the fourth quarter of twentieth century due to New Liberalism with limited government in advanced countries. Japanese domestic construction market has been changing since 1980s as a part of this trend.

In Japan, construction industry started to tackle new development for public works in 1960s after the damages of infrastructures during World War II were reconstructed in a short period. Because big infrastructure projects required a lot of investments, the World Bank fund was introduced to a project of intercity highway between Nagoya and Kobe, which was the first motor way in Japan. Through this process, Japanese public work procurement system was examined, and a consideration of overseas' engineering consultants, international tendering system, upgrading of specifications, design codes, and introduction of unit price contract were recommended by the World Bank.

After 1960s, constructions of infrastructures such as road, railway, harbor, airport etc. sharply increased. Bridge construction in number bases was in a peak from 1970s to the beginning of 1980s, and the number of large scale construction projects started to increase.

Since the beginning of 1980s, construction projects of Honshu-Shikoku Bridge, Tokyo Transit Bay Crossing and Kansai Airport came into the full stage and the construction market which had been one of the largest in the world were criticized because of the various barriers against foreign construction companies which were interested in Japanese market.

Review Meeting was held in August 1992 based on the several Japan-US construction talks since 1988, and advertised competitive bid was requested to introduce to Japan, and it gave an opportunity to supply international viewpoints to compare Japanese domestic construction market and the system with overseas ones.

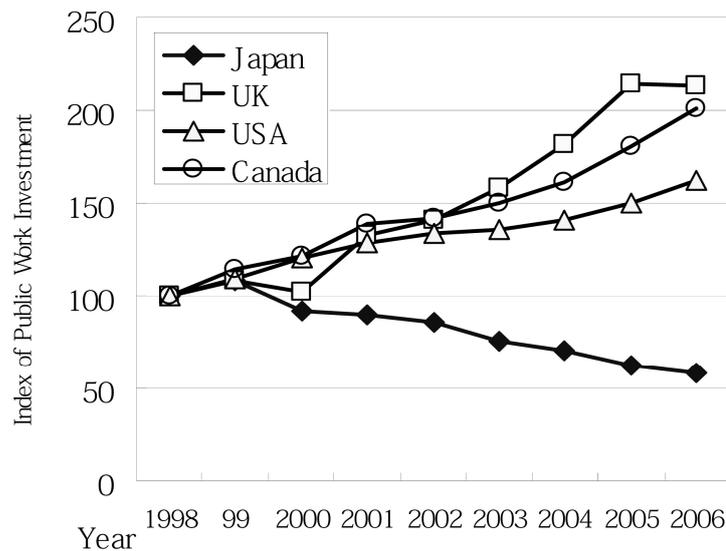


Figure 1: Index of changes in public work investment (1998 - 2006)

Various barriers in Japanese construction market, pointed out in the review meeting, were treated as trade issues and taken over to WTO through GATT (General Agreement on Tariff and Trade) meeting.

Reform of Tender and Contract System for Public Works was launched in January 1994 based on the discussion in Government Cabinet. According to this regulation, advertised competitive bid was decided to be introduced for construction projects that cost over ¥720bill. (\$7.2mill.). Then additional points of tendering method were revised in 1998, and new tendering method such as a technical proposal system was introduced.

Estimation system and failure of tender

Upper limit of acceptable tender price is determined by the Engineer's budget that is based on an average cost of materials, manpower and productivity using standard methods of construction. Accounting Law regulates that the lowest bidder is awarded within the limit of Engineers' budget and if there are no responsive bidders then the bid becomes failure.

Due to a rapid increase of infrastructure stock by past concentrated construction works in 1970s, maintenance, repair, strengthening and modification have been increasing and taking an important role in construction work. Cost estimation of maintenance work is generally complicated compared with new construction, and the estimation cannot necessarily be reflecting marketability and the number of failure of tender in maintenance work has been increasing. At the beginning of 2000s, construction companies that were specialized for maintenance works were established to respond to the increasing needs of maintenance work. But most of them were forced to dissolve due to unprofitable contracts.

Construction Collusion and Social Criticism

Structural impediment that was pointed out at the Japan-US construction Talk in 1989 to 90 included the constitution of Japanese construction industry with construction collusion, which seemed to have been constantly repeated since 1970s. In 1990s, a bribery scandal of major general contractors and municipal governments came in to light, also an involvement of former Minister of Construction in illegal mediation became clear. These two cases of collusion showed the existence of structural problems as a tip of iceberg in Japanese construction industry. It was pointed out that nominated tendering system was one of the causes because it built up adhesion between owners and contractors to leak out Engineers' estimation to intended contractors before the tender. The intended contractor was awarded by keeping the price high by restricting free competition.

To cope with construction collusion, surcharge system was introduced in 1977 and Japan Fair Trade Committee (JFTC) enforced detective accusation by rising up the surcharge rate in 1991. Fine for corporation was also raised up from five million to 100 million yen (¥500 mill. in 2002). Despite these enforced penalty clauses, constitution of construction industry with collusion was not improved, and a large scale collusion affair happened in 2004, in which a lot of related person from bridge construction companies and major owners were arrested and the companies were fined and the surcharge was collected. Criticism by mass media against construction industry was very severe, and it has caused fall down of the reliability on construction industry and respect to engineers. A part of the causes of decreasing of public work investment was promoted by the mood of the anti-construction. The decrease of public work investment for 10 years, starting from 1998 has reached 40 %, even though the needs for maintenance for deteriorated infrastructures have been increasing.

Table 2: Organization of railway construction, Kyoto – Ohtsu (1878 – 80)

| Head of Engineering, INOUE Masaru | | |
|-----------------------------------|--|--------------------------------|
| ----- | | |
| Project Manager, IIDA Toshinori | | |
| Contract section | Resident engineer | Procurement method |
| Kyoto-Fukakusa section | Musha Manka, Seventh grade engineer | |
| Fukakusa-Yamashina section | Tejima Kyuichi, Seventh grade engineer Hasegawa Kinsuke, Ninth grade engineer | Contract method |
| Ohsakayama-Ohtsu section | Satake Masaaki, Eighth grade engineer | |
| Ohsakayama Tunnel | Kunisawa Yoshinaga, Eighth grade engineer | ----- Forced account method |
| Kamogawa Bridge | Ogawa Katsugoro, Sixth grade engineer | |

The decrease of investment has been affecting the industry as a negative spiral such as a decline of attractiveness of the industry for young generation, decreasing number of employees, and fall-down of company investment of research and development as well as infrastructure security and safety for future society.

CHANGES OF PROCUREMENT AND MANAGEMENT SYSTEM FOR PUBLIC WORKS

Before Meiji Era (-1867)

In the middle ages, most public construction works such as river improvement, reclamation, irrigation, bridge erection, repair and maintenance work of structures and facilities were covered by voluntary labor services in the local communities which enjoyed the benefit or confiscated labor by authorities. This system was a kind of force account method, in which owners made up plans, designed, and carried out construction works by procuring labor force. After administration was stabilized under *Tokugawa Shogun*, lieges of *Shogun* were ordered to manage the construction works in Edo (present Tokyo). After the middle of seventeenth century, occupations called *Seoi* or *Kagomochi* who supplied unskilled labor force, appeared in urban areas, and owners procured labor forces for construction work. It was the late seventeenth century that contract method started to be used in the public construction works.

According to History of Tokyo City, Vol. of Industry, construction works were awarded by competitive bidding in 1678, one of those works was a bridge renewal project in Reiganjima and Minamikayabacho in Edo and the other was a repair work of trunk road in Edo. The tender announcement said "This is an announcement for construction tender. Anyone who is interested in following constructions works should submit tender after understanding the contents of the works."

Timber bridges required constant maintenance and periodic reconstruction. The maintenance works were procured by a contract method from the beginning of eighteenth century. A renewal work of the Shinohashi Bridge, Edo in 1719 and repair works of the Ryogokubashi Bridge in 1728 and 1732 were early examples of contract method in bridge construction. The contractors were awarded within limited candidates and names of *Shirakoya Kanshichi*, *Hishiya Kibe* were in the record of the long list. Both of them were treated as bridge specialist and awarded for comprehensive yearly based contract including inspection, repair, and renewal of bridges in Edo city, even though their main business was land load. Generally, the contents of contracts covered dispatching skilled labors such as rigger, supply of unskilled labor force with labor management or comprehensive and constant maintenance of bridges as mentioned above. These examples show that contract method was adopted for construction procurement in the first half of eighteenth century.

Contract method and Accounting Law in Meiji (1868-)

From the beginning of Meiji public construction works were covered by forced account method and contract method which had been adopted from middle age. Forced account method was adopted mainly in river construction works and the contract method was adopted increasingly in railway projects according as the expansion of lines.

From the beginning of Meiji, public construction works were covered by a forced account method and a contract method which had been adopted since the middle ages. The forced account method was adopted mainly in river construction works, and the contract method was adopted increasingly in railway project along with the expansion of lines.

Table 3: Changes of laws, rules and specifications for construction

| Year | Law, Rules and Specifications |
|------|--|
| 1872 | Prohibition of Guild (Anti-monopoly) |
| 1874 | Rule on construction for architecture, Dept. of Building, ME |
| 1881 | Specifications for architect and civil works for Maibira-Turuga Railway |
| 1886 | Specifications for railway work and earthworks for Tokaido Line |
| 1890 | Accounting Law (Meiji Constitution in 1889) Advertised competitive bid for all public works |
| 1896 | Civil Law. Contract clarified legally |
| 1899 | Revival of designated competitive bid by the Emperor's Order |
| 1922 | Act of road construction works. Lowest price in tender |
| 1921 | Revision of Accounting Law with designated competitive bid |
| 1946 | Rules for public works by GHQ |
| 1947 | Accounting Law, Local Government Law |
| 1948 | Ministry of Construction (Present MILT) |
| 1950 | Construction Industry Law Standard Specification for Construction Contracts |

The 29km railway connecting Shinbashi and Yokohama was opened in 1872 as the first railway in Japan. British engineer, *Edmond Morel* (1842 -1871), and other foreign engineers took important roles in this construction. The first railway construction was followed by the line between Kobe and Osaka in 1874 and the line between Kobe and Kyoto in 1877. Since then, railway network was extending to all over Japan. These early railway constructions were mainly covered by single source contract or negotiated contract.

Most important and interested matter for Japanese engineers was to be engineering independent from Western engineers as early as possible in construction.

Kyoto-Otsu Railway, commenced in June 1878 and completed in June 1880, was the first railway construction project that was executed only by Japanese engineers. All sections of the project, except bridge and tunnel sections, which required high techniques, were awarded by negotiated contract. *Inoue Masaru* (1843-1910), Director of Railway Dept. took office as the Head of engineering of this particular project in person. Most of the resident engineers were the graduates of the engineering school called *Kogiyoseijo* at *Osaka* where the project manager, *Iida* used to be an instructor.

Among railway construction, which had been mostly covered by designated competitive bidding system and single source or negotiated contract, first advertised competitive bid was launched in 1884 for the contract of the part of circle line in Tokyo with a length of 21km. After this contract, advertised competitive bid was promoted. In 1890 Accounting Law was implemented by following Meiji Constitution in 1889, and the article 24 of the law regulated that all public construction works were covered by advertised competitive bid in principle. Adoption of advertised competitive bid caused a confusion in the relationship between owners and contractors because those relationships were based on the trust, created by execution of construction works ordered by designated competitive bidding, single source or negotiated contract from the beginning of railway construction. Since many railway construction works had been continuously ordered, past achievements of the construction works and communications between owners and contractors were useful information to select appropriate contractors for next projects. However, owner's intention could not be reflected by advertised competitive bid and contractors were awarded without any consideration of past achievements or performance. Many inexperienced contractors rushed to tenders and the excessive price competition produced bankruptcy of contractors, which affected the quality and the progress of railway construction.

Just before Accounting Law was implemented, Japan Civil Engineering Co. Ltd., the first large scale general contractor with modern cooperate organization was established in 1887 to respond to the needs of construction industry. This company intended to be awarded by single source contract or negotiated contract by company's engineering reliability with many highly paid capable engineers and skilled workers. Against its intention, the company was forced to go bankrupt soon after the implementation of Accounting Law. This was the lesson to learn at the end of nineteenth century that advertised competitive bid regulated in Accounting Law was unfamiliar system for Japanese construction industry.

Once advertised competitive bid was recognized that it did not function well in the execution of public works, designated competitive bid was introduced again in 1899 in the form of Emperor's Order without any procedures of the revision of the law. One of the examples was railway construction project (1896 – 1911) of Central Line with 4.8km length Sasago tunnel, which required high techniques. Experienced contractors were nominated and awarded by designated competitive bid against the regulation of Accounting Law.

Accounting Law, which had been castrated by Emperor's Order was finally revised in 1921 and designated competitive bid and negotiated contract were formally introduced again. Since the revision of the law was taken place, the designated competitive bid had been commonly used until the middle of 1990s.

Contract and specifications

Construction contract in the form of paper was used before Meiji. Specifications as a document of construction contract were firstly enacted in 1874 for architecture by Dept. of Building, Ministry of Engineering and, the detailed rules were issued in the next year.

First specifications for railway construction to regulate the detailed procedures of the work were *Specifications and Dos and Don'ts of Contractors for Architect and Civil works of Maibira-Turuga Railway*. The work was commenced in 1880 and the document issued in 1881, it was after the commencement regulated specification of cut and bank, prohibition of subcontract of entire work, cancellation of contract, payment conditions and bond etc.

In the payment conditions, monthly payment was up to three times and 80% of the performed work amount, and the retention of 20% were paid after the completion. Performance bond, 10% of contract price, was paid back to the contractors six month after the completion with a bonus of 50% of the bond price.

Construction of Tokaido Line, a trunk railway connecting between Tokyo and Osaka was commenced in 1886 and completed in 1889. In this project, *Specification and Dos and Don'ts of Contractors for Railway Work and Earthworks* was regulated. In this contract documents, commencement of work after contract, delay of the period and penalty, cancellation of contract, required experience, contractors' property, payment conditions etc. were regulated in 13 articles. This contract documents also covered tender procedures such as bid bond, guarantees, and awarding of tender. An article says "An awarded bidder isn't necessarily the lowest bidder. Qualified chief engineer has an authority to determine the awarded bidder based on his judgment".

Procurement system after World War II

In 1947, Accounting Law was revised and Local Government Law was implemented. Both laws regulated the tender system for public works with three methods; advertised competitive bid, designated competitive bid, and negotiated contract. In the law, advertised competitive bid shall be adopted in principle and others shall be used optionally for special cases. However, *Standard of Designation* was set up in 1961 and then designated competitive bid became common tender method in Japan until 1990s. Construction Business Act, which was a fundamental law to regulate procedures of procurement of public works including contract, was implemented in 1949.

DISCUSSION

Characteristic of a public construction work

In the process of the development of hard technology around the Meiji, discontinuation was seen, it was caused by transferred engineering knowledge from Western countries. On the other hand, changes in the development of the soft technology were more moderate compared with the case of a hard technology. Modern soft technology was basically an extension of pre-modern system, and did not change even when hard technology drastically changed in the latter half of nineteenth century. The difference of the changes between hard and soft technology shows the characteristic of Japanese public work procurement and management system. Soft technology including contract system for public works continued until 1990s without drastic changes and met global standard at Japan-US Construction Talks. Japanese construction market, governed by the soft technology, was inevitably recognized as pre-modern system with various trade barriers. Procurement and management system has been consistently functioning under owners' strong leadership since Edo era to 1990s. Basic form was the forced account method in which owner acted a role as if they executed the entire construction work with labor force supplied by contractors.

Continual relation based on mutual trust and reliability between owners and contractors is indispensable for the force account method, which differs from the relation between selling and buying goods one by one business likely. This was shown by confusion, caused by an implementation of Accounting Law in 1890 that introduced an advertised competitive bid, and following policies that were adopted to make the designated competitive bid by Emperor's Order be possible to be adopted.

Factors to produce the character

Japanese procurement and management system was based on the custom that put a priority on consensus or harmony rather than competition. Advertised competitive bid that was based on free competition could not go together with designated competitive bid, which was based on close and continuous relationship between owners and contractors. Competition in public work procurement was not recognized as an important factor before World War II. It was in 1947 that Anti-monopoly Law was implemented. Even after World War II, commercial institution based on uncompetition by designated competitive bid was producing collusion.

Another factor to compose commercial institution was a closed market where only limited people were allowed to join. Guild called *Kabunakama* or *Kou* which was common system in commerce since 16th century in Japan.

The Commerce privilege to limited member to join tender was once prohibited in 1872 by Meiji Government. However the Guild was under the control of government and survived substantially.

Closed membership system was basically the same system of designated competitive bid which was based on closed and continuous relation in closed societies.

Consideration from communications

Execution of contract is based on communications among owners, contractors and related members of the contracts. It is said that communication in general is composed of code and context. If we think execution of construction contract as a series of communications, code is information directly related to the construction work such as specifications, drawings, contract documents, related laws, regulations, instructions, order, or references in the form of letter or other media. Context is background information to compose the fundamentals of meanings such as human relations among related members, society system and common sense, custom, commercial institution, language, sense of value, nationality, etc. Context is a non-language communication and code is a communication based on language.

In Japanese society a level of importance of context is quite high compared with other society, and if the execution of contract is based on the series of communication, the difference in the way of communication shows the characteristic of procurement and management system.

From the latter half of nineteenth century to 1990s, context was formed by daily-basis, closed contact between related members within closed market through repeated execution of contracts. Construction contracts were awarded by contractors from the limited members who could shear context without too much code.

High context in Japanese construction industry still continues, and it appeared in the article 18 in Construction Business Act as follows;

Related person involved in the contract of the construction works shall conclude a fair contract on the bases on equal position and act in a spirit of mutual trust.

This clause shows that construction contract shall be based on *mutual trust* which is a context.

CONCLUSIONS

Hard technology developed in the latter half of nineteenth century with drastic changes by introducing advanced knowledge from Western countries. On the other hand, soft technology was developing as an extension of pre-modern system, and now procurement and management system for public work is changing to search for efficiency and economy.

The change of procurement and management system started from Japan-US construction talks in the beginning of 1990s.

Japanese system was based on the custom that put a priority on harmony rather than competition. Advertised competitive bid that was based on free competition could not go together with designated competitive bid, which required closed relationship that was supplied by closed market and composed of limited members.

Japanese system has been functioning based on closed and continuous relationship based on mutual trust and reliability between owners and contractors in designated competitive bid rather than advertised competitive bid. From the viewpoint of communications, execution of contract of construction works depends on high context, and this appeared in the clause of Construction Business Act.

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