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Integration of the Value Chain to Enhance the Productivity and Efficiency of the Construction Industry

I. Summary

Up until about 1960, general contractors in Japan generally adopted a direct management style in which they procured their own labor and equipment, but since then, as construction volumes increased with economic growth, division of labor and specialization in construction production have come to be implemented as a more rational and efficient form of corporate management. General contractors have begun building value chains by forming loose groupings of companies that retain their independence. Plentiful investments in construction continued up until the mid-1990s, and there were enough construction works for every company, including newcomers. Based on collaborative relationships with clients, general contractors improved their technological and construction skills while earning a reasonable profit. They rarely filed claims to their clients , and managed their businesses with an emphasis on respect for project deadlines, outstanding quality, and safety. Thus, over a long period of time spanning the past half century, the Japanese construction industry has been building an environment in which clients and contractors, working as business partners, have promoted projects by forming cooperative win-win relationships.

In this decade after the collapse of the bubble economy, however, construction investment shrank from more than ¥80 trillion to the ¥50 trillion level, the number of construction companies compared to the downsized market resulted in oversupply, and the number of bankruptcies increased. All of these factors left the Japanese construction industry facing a serious downturn. Given that the size of the domestic construction market is not expected to expand any time soon, it has become difficult for general contractors to remain in business on the strength of their long-term relationships with clients alone.

The Japanese construction industry is entering a period of genuine corporate competition, leaving construction companies with little option but to restructure themselves or to be shaked out. These conditions can give rise to several kinds of problems, including low-price bids (dumping bids), concerns about construction quality, and unfair pressures on subcontractors. On the other hand, the social infrastructure is growing and buildings are being developed, so there will be growing needs for the maintenance, management, and upgrading of those facilities in the future. Facility management is thus going to have to be performed with an eye toward life-cycle costs. Stakeholders in construction production are going to have to create new value chains that can enhance productivity and efficiency to levels that can meet the needs of a new era while taking advantage of contractual relationships that have been long maintained through mutual trust.

To ensure the development of a more appealing construction industry, the government has a large role to play in the integration and improvement of value chains, and the standardization of basic administrative procedures has been implemented nationwide. The most important process, the building certification application, is being standardized across Japan. The bidding, contracting, delivery, and technology registration processes of the Ministry of Land, Infrastructure and Transportation (MLIT) have all been digitized and are now managed through a database.

General contractors are also using information and communication technologies (ICT) to create an environment where supply chain members can use information regarding project management and materials/labor procurement, easily and at low cost. This is designed to promote information sharing, to accelerate the decision-making process, and to increase

efficiency. General contractors, in particular at the work-site, are striving to adhere to project deadlines and quality requirements by improving the production process through constant, detailed ingenuities in their daily work.

The technological capability and know-how that has been accumulated in the Japanese construction industry can contribute to economic growth and help improve people's everyday lives in developing nations as well as developed nations. By engaging in construction activities in countries around the world, including those in Asia, Japanese construction companies hope to contribute to the economic development of the countries and regions in which they establish operations, using their internally developed technological capabilities and expertise. They also hope to contribute to the advancement of local construction companies and businesses through technology transfers, and to promote the development of outstanding social infrastructure.

II. Initiatives and Measures to Integrate the Construction Industry Value Chain

1. Integration of the Construction Industry

1.1 Features of the Japanese Construction Industry

An Environment That Breeds Advanced Technological Skills and Excellent Construction Skills

Japan has made enormous investments in domestic construction in both the public and private sectors since the postwar recovery period (1950-55), and has developed an advanced industrial state in spite of its small land area and tough natural conditions. Over the course of a half-century of activity, the Japanese construction industry has accumulated advanced technological skills and know-how that are one of the best in the world. Also, because the construction industry is typically highly localized, with a strong emphasis on domestic demand, construction industry activities tend to involve the same players in a given region who interact with one another on a long-term, continuous basis. For this reason, highly collaborative relationships are built between clients, designers, and builders, and Japanese construction companies that have thus far had filed few claims against clients, have developed advanced technological capabilities and excellent on-site construction skills by emphasizing respect for project deadlines, outstanding quality, and safety. The British concept of partnering was derived out of a desire to learn the collaborative methods adopted by Japanese clients, designers, and builders. In this way, over a long period of time spanning the past half century, the Japanese construction industry has been creating an environment in which clients and contractors, working as business partners, have promoted projects by forming cooperative win-win relationships.

Relationships between Clients and General Contractors

Since the ability to build trust with clients is an important factor in the survival of a general contractor in Japan, they pour all their efforts into the goals of meeting deadlines and ensuring quality on construction projects. It is therefore rare for a general contractor to complain to a client about a project. It must be noted that this relationship differs from the British system of partnering in that it tries to prevent complaints in advance by emphasizing transparency and establishing decisions ahead of time about how matters will be handled if a profit or loss is incurred on a particular project.

Highly Reliable On-Site Construction System: Relationship between General Contractors and Subcontractors

As is the case in the relationship between the client and general contractor, subcontractors prefer to earnestly discuss issues with the general contractor out of a sense of loyalty, rather than debate issues based on a contract. They express a positive attitude on moving forward with a project, indicating their intent to meet the deadline and perform quality work. Many general contractors form groups comprised of their preferred subcontractors, allowing them to build highly reliable on-site construction systems.

1.2 Current State of the Japanese Construction Industry

Moving from a Time of Cooperative Prosperity to a Time of Corporate Competition

Up until the collapse of the bubble (1992 to 2004), there were enough construction projects for everyone, including new construction companies. Japanese construction companies, based on collaborative relationships with clients, continued to thrive and prosper while earning a reasonable profit. In this decade after the collapse of the bubble economy, however, construction investment shrank from more than ¥80 trillion to the ¥50 trillion level, the number of construction companies compared to the downsized market resulted in oversupply, and the number of bankruptcies increased. All of these factors left the Japanese construction industry facing a serious downturn. Given that the size of the domestic construction market is not expected to expand any time soon, it has become difficult for construction companies to remain in business on the strength of their long-term relationships with clients alone. The Japanese construction industry is entering a period of genuine corporate competition, leaving construction companies with little option but to restructure themselves or to be shaked out. These conditions can cause changes in the win-win relationship and trust that has evolved between clients, general contractors, and subcontractors, and can result in several kinds of problems, including low-price bids (dumping bids), concerns about construction quality, and unfair pressures on subcontractors.

Changes in the Value Chain

Up until about 1960, general contractors generally adopted a direct management system in which they procured their own labor, equipment and materials. Since then, however, as construction volumes increased with economic growth, the system of using subcontractors has come to be viewed as more efficient in terms of the management and use of technologies, human resources, and equipment compared to the directly managed system of general contractors. In this process, on-site construction work has been outsourced to subcontractors, and general contractors themselves have become specialized in coordinating the management of those various outsourced subcontractors. In this way, general contractors have been building value chains by forming loose groupings of companies that retain their independence. (See Figure 1-1.)

However, with the domestic construction market shrinking as was mentioned earlier, general contractors are showing a strong tendency, as a result of intense price competition, to select subcontractors based on whether they can do the work needed at the lowest cost, rather than their membership in the general contractor’s group. On the other hand, because subcontractors need to ensure that they receive a certain amount of work, they are starting to work for multiple general contractors. This is reducing the uniqueness of the value chains that the general contractors have created with their subcontractors. (See Figure 1-2.)

Figure 1-1 Changing Roles in the Relationship between General Contractors and Subcontractors

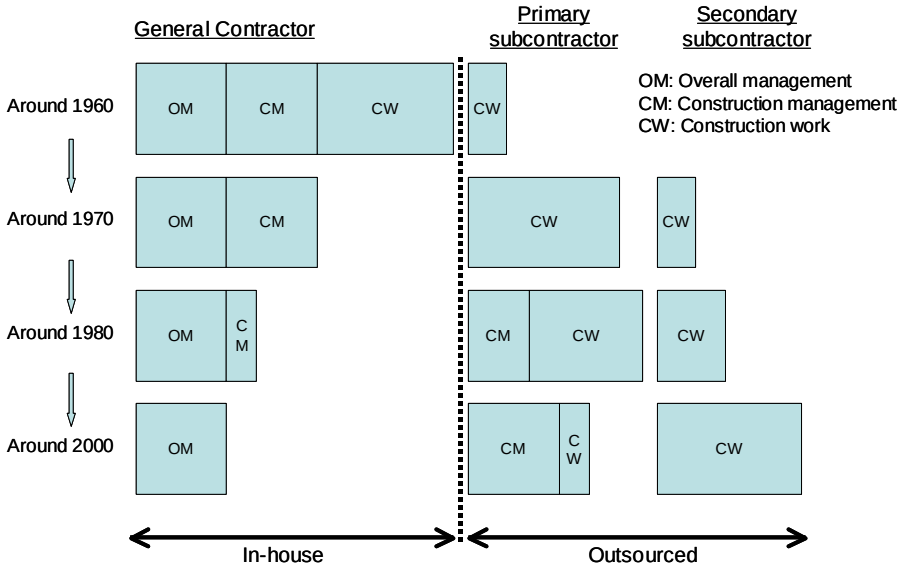
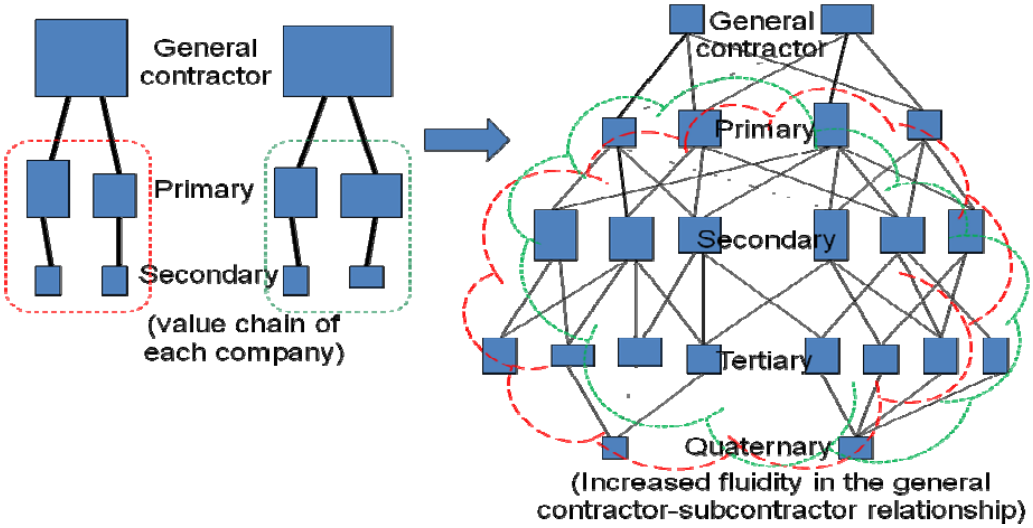


Figure 1-2 Development of Less Rigidity and Greater Stratification in Subcontractors



1.3 Future Issues the Construction Industry Must Address

The Formation of a More Appropriate Competitive Environment

To develop a more appealing construction industry in the future, it is important to build a systematic framework in which doing better work will give construction companies access to greater work opportunities in the future. That is, efforts must be made to create a competitive environment in which the principle of competition functions properly, and the companies that excel in technologies and management capabilities can be fairly selected by customers and given the chance to grow. In this case, the British partnering concept may very well serve as a useful point of reference, but investigations must proceed with a full awareness of the differences between the historical context of Japan and the UK, where partnering emerged against the backdrop of frequent complaints regarding construction delays and cost overruns.

Clarification of Roles and Responsibilities

Given the particular traditions and customs of Japan, contractual clauses between clients, designers, and construction companies often contain wording such as "After deliberations between A and B, changes may be made to the project deadline or contracted amount, as needed." This is a very vague clause premised on the principle of good faith and trust, which does not explicitly state the cases in which such changes might be made. In some cases, work orders are not even documented between subcontractors who are closer to the bottom end of the supply chain, and work often begins based on a verbal agreement alone. However, due to changes in the bidding and contract system for public projects, such as the expansion of general competitive bidding, and due to increased competition for private construction work as a result of the contraction in the domestic construction market, it is feared that the number of complaints between these parties is going to increase, and that the members of the value chain will need to clarify the roles and responsibilities of each party involved by promoting active dialogue and more clearly documenting contract terms.

Global Development of Outstanding Technological Capabilities and Expertise: Contributing to Destination Countries and Regions

Today, there is a growing need for infrastructure development to promote economic growth and improve the lives of citizens in developing as well as developed countries. Japanese construction companies engage in construction activities all over the world, including Asia. They hope to contribute to the economic development of the countries and regions in which they establish operations using the technological capabilities and know-how they have developed thus far. They also hope to contribute to the fostering of local construction companies and businesses through technology transfers, and to promote the development of outstanding social infrastructure .

2. Standardization of Administrative Practices and Procedures

The standardization of administrative practices and procedures plays a major role in integrating and improving the value chain. There are many different government permits and other procedures involved in the implementation of a construction project. Integrating them nationwide, ensuring the transparency of the procedures, and making it possible to estimate how long it will take to complete the necessary procedures would all go a long way toward improving construction production efficiency. For example, Japanese buildings are built in accordance with the Building Standard Law of Japan, which establishes minimum standards regarding building lots, structures, equipment, and use. Since the Act was enacted in 1950, all buildings located throughout Japan have been built to meet the basic standards established therein. One of the basic administrative procedures established by the Act is the building certification application. The application process is the same throughout Japan. Because the applications are submitted to either a building official or [a private designated certification inspection agency], there are very few problem cases. Also, since the inspection period is determined by the authorization office, there is little chance that the project will be delayed if the project schedule includes a reasonable allowance for the inspection period.

Figure 2-1 Inspection Periods for Building Certification

General buildings	Max. 35 days
Buildings using advanced structural calculations	Max. 70 days

In addition, procedures related to public project procurement, urban planning procedures, and procedures regarding the use of public facilities are also standardized by the Acts respectively.

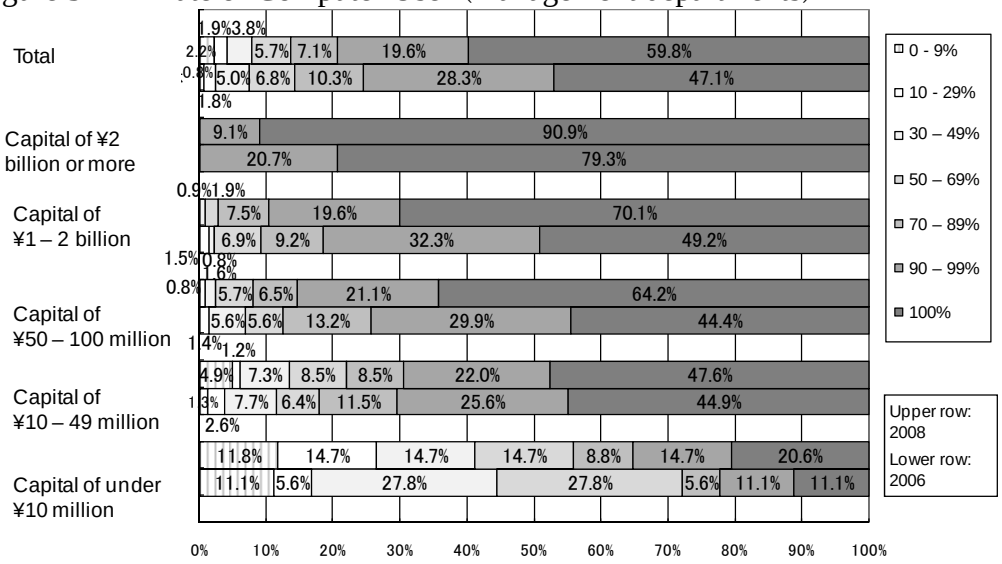
To improve convenience and simplify procedures, efforts began in 2001 to launch the “e-Japan” project. This project aimed to digitize all administrative procedures nationwide, starting by enabling users to submit applications and reports to the national government and local government agencies online. The information systems of the national government and major local governments have been enhanced, but because security and identity verification procedures are complicated, the rate of use is only a low 17% (2006). The goal is to raise the rate of use to 50% by 2010.

3. Use of Information and Communications Technology (ICT)

3.1 ICT Use in the Construction Industry

ICT is being used in increasingly sophisticated ways in the construction industry. Government and businesses are using ICT to improve administrative efficiency, cut costs, boost added value, improve customer satisfaction, and ensure transparency and fairness.

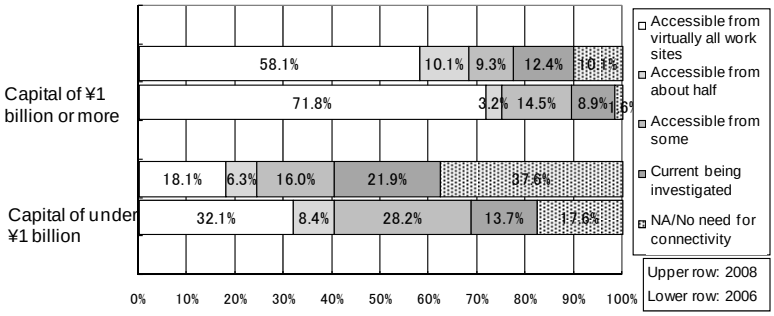
Figure 3-1 Rate of Computer Use（management departments）



The rate of computer use among Japanese construction companies increased dramatically in the 2000s, at the same time the Internet came into more widespread use. Construction company management departments handle huge volumes of information arising from financial transactions between subcontractors and clients, the payment of employee salaries, welfare benefits, and human resource issues. The larger the company, the higher the volume and complexity of information they will handle. Computers offer the most efficient way to process all that information.

The use of corporate intranets is also increasing. Survey results show that 70% of companies with ¥1 billion or more in capital have their own intranets.

Figure 3-2 Rate of Use of Corporate Intranets



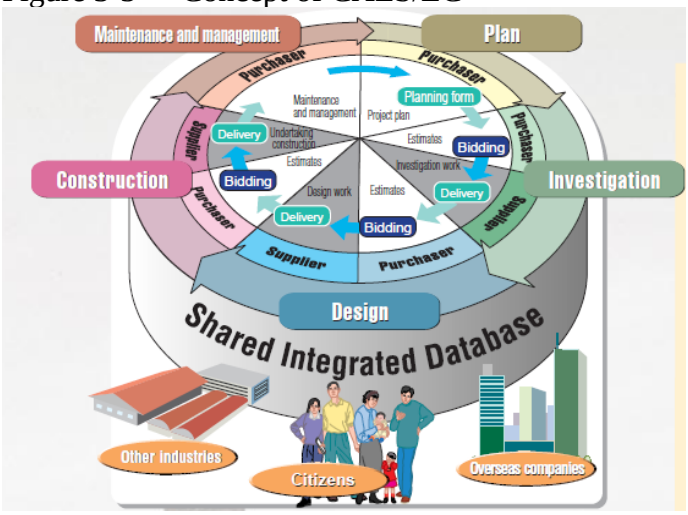
In the construction industry, information tends to stop at the boundaries of the construction site, but information sharing between management and the construction site may be able to help reduce costs and improve efficiency.

3.2 Efforts by the Ministry of Land, Infrastructure and Transportation (MLIT)

The MLIT uses a government-private ICT system known as the Continuous Acquisition and Life-cycle Support/Electronic Commerce (CALS/EC) for the electronic bidding, electronic approvals, electronic contracts, and electronic delivery. It improves efficiency and promotes information sharing, and is helping to improve the quality of public projects.

The system also has advantages for private companies in that it reduces administrative work and makes it easier to obtain bid information. Electronic bidding was used in about 90% of the projects directly managed by the MLIT in FY 2006.

Figure 3-3 Concept of CALS/EC

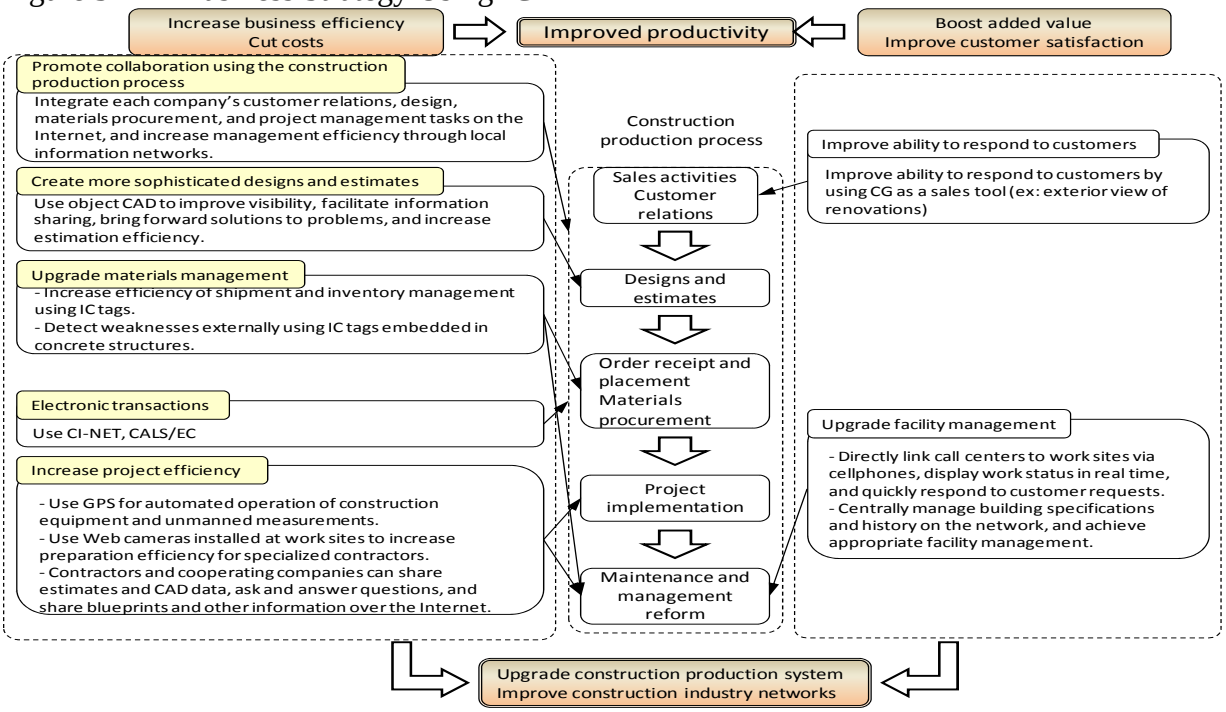


3.3 Efforts by Private Companies

To cut costs, boost added value, and improve customer satisfaction, private companies have been striving to increase efficiency across the entire construction production process by creating networks that include clients, partner companies, and other relevant parties, and by incorporating ICT into bidding, delivery, ordering, project management, materials management, and contract management. To set themselves apart from other competing companies in their order-receiving processes and their commitment to finding solutions for

customers, many companies in recent years have been proposing ways to integrate the construction process with security, inventory management, and sound management systems, and have developed businesses that involve sharing maintenance information and long-term repair plans for completed construction projects with customers.

Figure 3-4 Business Strategy Using ICT

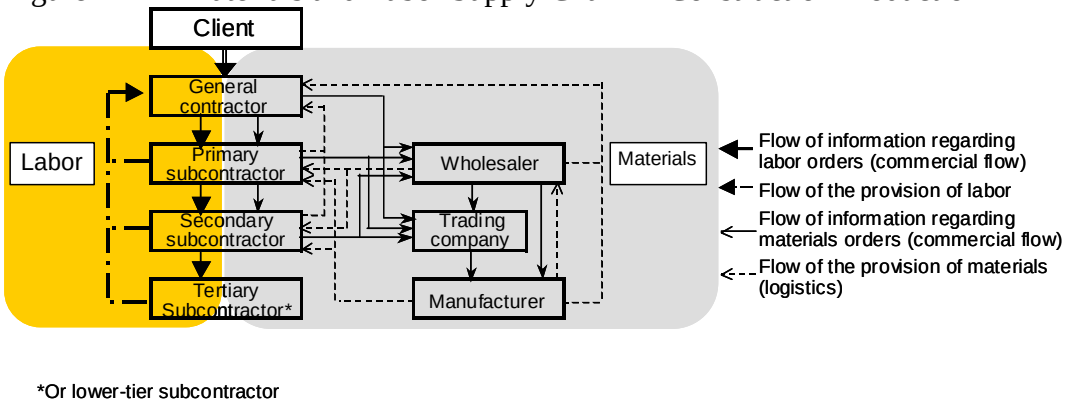


4. Innovation in Materials and Labor Procurement among Japanese Construction Companies: Centralized Procurement

4.1 Current State of the Supply Chain for the Procurement of Materials and Labor among Construction Companies

The Japanese construction market expanded dramatically during the period of high economic growth (mid-1950s to the 1970s) and the bubble economy (late 1980s to the early 1990s). As the construction companies as a whole pursued rationality and efficiency in construction production, they developed a production system with a vertical and decentralized structure. As a result, materials and labor procurement was handled by various suppliers at different levels of the hierarchy (Figure 4-1). Since the ability to meet project deadlines and perform quality work are their lifelines, general contractors, especially those that play a role on-site, strive for constant, detailed procurement management in their daily activities.

Figure 4-1 Materials and Labor Supply Chain in Construction Production



*Or lower-tier subcontractor

Materials Procurement Supply Chain

There are two main routes by which materials are procured. Either the general contractor procures materials from the manufacturer themselves, or a primary or secondary subcontractor procures materials on behalf of the general contractor. There are various intervening parties, which can include trading companies, processors, or wholesale merchants, depending on the type of material needed or the region where the work is being done. Materials can arrive at a worksite via several different logistical channels. They might come directly from the manufacturer, be shipped via a wholesaler, or be shipped after undergoing some kind of processing at a designated processing company.

Labor Procurement Supply Chain

General contractors most often procure labor by placing an order with a primary subcontractor . The primary subcontractors nowadays rarely have skilled workers working as direct employees. Rather primary subcontractors will procure skilled workers directly as temporary workers, or from secondary or tertiary specialized subcontractors. During the busy season, a general contractor may have to procure skilled workers from new companies if they cannot secure the workers they need from their secondary subcontractors. In this case, those workers may do lesser quality work if they are not managed appropriately.

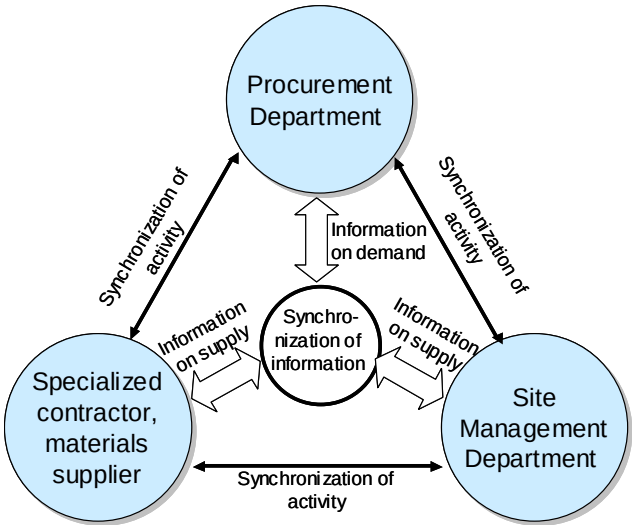
Supply Chain for Integrated Materials and Labor Procurement

When the general contractor procures both materials and labor together from a primary subcontractor, the primary subcontractor may procure its own materials while procuring labor from a secondary or lower-tier subcontractor, or may provide some of the labor itself, as well.

4.2 Innovation in Materials and Labor Procurement Management among Construction Companies: Integrated Procurement

The procurement of materials and labor discussed above has conventionally been done for each construction site. However, because on-the-spot procurement makes it difficult for procurement information to be collected and used appropriately and efficiently, and also makes it difficult to take advantage of economies of scale, companies have begun instead to use centralized procurement, in which the company headquarters or purchasing departments handles all procurement activities centrally (see Figure 4-2).

Figure 4-2 Synchronization of Activities through the Synchronization of Information



In integrated procurement, the process planning and management of individual work sites is linked for the purpose of improving construction productivity and reducing production costs. Information is promptly and accurately conveyed to the supply chain, and materials and labor are delivered "just in time." This makes it possible to reduce inefficiency and waste in the production process.

Integrated procurement also requires that the necessary information is provided to various suppliers at the appropriate times, that is, that procurement information be synchronized. Recent developments in ICT have made this possible. Large and medium-sized general contractors are using ICT and have created environments where their supply chain members can have easy and low-cost access to their purchasing information. Administrative efficiency is improved by the sharing of materials and labor procurement information and by accelerating the pace of decision-making.

4.3 Futures Issues in Materials and Labor Procurement

Improving Procurement Efficiency among Small and Medium-Sized Companies

Supply chain members, including general contractors, specialized subcontractors, materials manufacturers, and wholesalers are striving to use centralized purchasing to improve construction productivity and decrease production costs, and their efforts are yielding results. However, it is difficult for small and medium-sized companies to sustain these efforts due to limited purchasing power, human resources, and capital. Increasing procurement efficiency among small and medium-sized companies is going to be a particularly important issue in the future.

Promoting Green Procurement

Construction companies typically use a wide variety of materials in rather high volumes, and thus can have both a direct and indirect impact on the environment by purchasing materials. The Japanese construction industry has thus been making efforts to promote green procurement, taking an active role in building and maintaining a sustainable society. To achieve green procurement, construction companies have to adopt their own green

procurement standards and guidelines, and must create systems in cooperation with their suppliers to achieve their goals. Going forward, both parties need to work collaboratively to achieve green procurement. Even in the design stage, construction companies should make proposals to clients and designers for the use of recycled construction materials and environmentally friendly products. Also, construction companies need to promote green procurement by creating green procurement standards for everything from construction materials, to work uniforms, to office supplies.

III. Conclusion

After the collapse of the bubble economy (which lasted from 1992 to 2004), construction investment has declined slowly as the Japanese economy slowed down. In the current environment, where significant growth is not expected to occur in the near term, the construction industry is on the verge of a shakeout driven by increased competition.

Thus far in the Japanese construction industry, clients and construction companies entered into and carried out construction projects based on a general relationship of trust, which included the assurance of a certain level of price and quality. Also, clients have used general contracts that cover all of the tasks related to a construction project to take advantage of the construction companies' high capabilities in problem-solving skills during and post construction processes, including risk management and consensus formation skills. However, in an increasingly competitive environment, both sides are being required to cut costs and increase transparency. Under lump sum contract, construction companies have sometimes borne excessive risk because of the vague nature of the contract terms, but now there is a growing need to explicitly state the specific responsibilities of each party in the contract.

Given these circumstances, the Japanese government and construction industry are working hard to ensure that construction industry as a whole has the creativity and vitality required for the economic and social needs of the 21st century. They are also standardizing administrative procedures and developing an environment that is conducive to the use of ICT, and working to create a competitive environment in which market principles are functioning properly and the companies that excel in technology and management capabilities can be fairly selected by customers and given the chance to grow.