The 13th

ASIA CONSTRUCT CONFERENCE

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JAPAN COUNTRY REPORT

Japan Country Report

2007

PREPARED BY

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Japan Country Report

Chapter 1: Overview

The Japanese economy is continuing to recover at a moderate pace, posting a real economic growth rate of 2.1% in fiscal 2006. In fiscal 2007, improvements in the corporate sector are expected to trickle down into the household sector, and moderate economic growth supported by private domestic demand is expected to continue.

Japan's construction investment is still sluggish. Construction investments in fiscal 2006 were valued at ¥52.3 trillion yen (¥18.4 trillion in government projects, ¥33.9 trillion in private projects), about half of the peak value (fiscal 1995). While government construction has consistently declined over the past several years, private construction has increased, and this trend is expected to continue.

Recent trends in the construction industry are as follows:

(1) Small and medium-sized companies with fewer than 100 employees account for 97.9% of construction companies, and their share of the market has been increasing in recent years.

(2) Statistics on the number of construction industry employees by occupation show a noticeable decline in the number of employees working for general contractors.

(3) The trends toward decreased construction investments and declining labor productivity in the construction industry, due to various productivity impediments at construction sites and within companies, are continuing.

(4) The cost of materials has been on the rise in recent years due to high steel prices worldwide. On the other hand, employee wages are lower in the construction industry than in other industries.

(5) The overseas construction orders received by Japan reached their highest level ever in fiscal 2006, hitting ¥1.648 trillion. Growth has been particularly significant in the Middle East.

Chapter 2: Macroeconomic Review and Future Projections

2.1 Overview of the Japanese Economy

The Japanese economy is gradually recovering. The real economic growth rate has remained consistently higher than 2.0% for four consecutive years since fiscal 2003, reaching 2.1% in fiscal 2006. The growth in exports, made possible by a robust international economy, has contributed to the growth of corporate earnings, and this has led to an improvement in business sentiment and increased capital investment. This trend has been a major factor in the economic growth rate trend. In fiscal 2006, net exports of goods and services increased 25.6% over the previous year (contributing 0.8 points to GDP), and corporate capital likewise increased 7.9% (1.2). Both have contributed to the economic recovery.

This moderate economic recovery, sustained by private demand, is expected to continue in fiscal 2007. The Research Institute of Construction and Economy (RICE) estimates that the real economic growth rate for fiscal 2007 will be 2.0%. The year-on-year growth rate for various categories are (figures in parentheses indicate points contributed to GDP) 1.8% for private final consumption expenditures (1.0), 4.1% for private corporate capital (0.7), 14.2% for net exports of goods and services (0.6), and 1.0% for government final consumption expenditures (0.2). Since personal consumption is expected to increase gradually as the employment situation improves, these figures reflect particularly high projections in the growth rate of private final consumption. This means that improvements in the business sector are showing a domino effect on the household sector, thus helping to sustain private domestic demand. Capital investment is expected to continue to increase as a result of continued improvements in corporate earnings, and though there are still challenges to be overcome in the employment situation, improvements are evident in the form of a decrease in the total unemployment rate and an increase in the number of employees. Meanwhile, government policies to constrain public works projects are expected to result in a significant 8.6% (-0.3) decrease in public fixed capital formation. It will be important to keep an eye on factors that could exert downward pressure, such as overseas economies (particularly the United States), and the trends in crude oil prices.

Figure 1　Macroeconomic Trends (fiscal year)

							Actual←	→Estimated	
FY	1990	1995	2000	2003	2004	2005	2006	2007	2008
Real GDP	467,913	482,750	505,622	517,715	527,827	540,430	551,755	563,012	574,682
(Y-o-Y growth rate)	6.0%	2.5%	2.6%	2.1%	2.0%	2.4%	2.1%	2.0%	2.1%
Real private final consumption expenditures	249,477	273,764	283,758	293,069	296,888	302,492	304,682	310,232	316,091
(Y-o-Y growth rate)	4.8%	2.5%	0.7%	0.6%	1.3%	1.9%	0.7%	1.8%	1.9%
(Contribution to GDP)	2.6	1.4	0.4	0.4	0.8	1.1	0.4	1.0	1.0
Real government final consumption expenditures	62,230	74,716	85,714	92,331	93,891	94,773	95,599	96,551	97,515
(Y-o-Y growth rate)	2.9%	4.1%	4.3%	2.6%	1.7%	0.9%	0.9%	1.0%	1.0%
(Contribution to GDP)	0.5	0.6	0.7	0.5	0.3	0.2	0.2	0.2	0.2
Real private housing	26,457	23,953	20,361	18,357	18,662	18,475	18,548	18,432	18,154
(Y-o-Y growth rate)	6.0%	-5.6%	-0.1%	-0.2%	1.7%	-1.0%	0.4%	-0.6%	-1.5%
(Contribution to GDP)	0.3	-0.3	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Real private business capital	90,489	67,869	72,963	73,316	77,904	82,384	88,894	92,558	97,158
(Y-o-Y growth rate)	12.0%	3.1%	7.2%	6.1%	6.3%	5.8%	7.9%	4.1%	5.0%
(Contribution to GDP)	2.2	0.5	1.0	0.8	0.9	0.8	1.2	0.7	0.8
Real public fixed capital formation	29,824	40,602	34,445	28,104	24,525	24,183	21,872	19,985	18,475
(Y-o-Y growth rate)	4.1%	7.5%	-7.6%	-9.5%	-12.7%	-1.4%	-9.6%	-8.6%	-7.6%
(Contribution to GDP)	0.3	0.6	-0.6	-0.6	-0.7	-0.1	-0.5	-0.3	-0.3
Real inventory increase	2,487	1,774	2,043	1,127	1,839	1,451	1,650	1,709	2,045
(Y-o-Y growth rate)	-11.7%	15458.8%	192.2%	626.1%	63.1%	-21.1%	13.7%	3.6%	19.7%
(Contribution to GDP)	-0.1	0.4	0.8	0.3	0.1	-0.1	0.0	0.0	0.1
Real net export of goods and services	6,949	959	6,295	11,263	14,083	17,043	21,410	24,446	26,142
(Y-o-Y growth rate)	11.8%	-79.2%	7.5%	57.0%	25.0%	21.0%	25.6%	14.2%	6.9%
(Contribution to GDP)	0.2	-0.7	0.1	0.8	0.5	0.5	0.8	0.6	0.3
Nominal GDP	451,473	496,457	504,119	493,748	498,275	503,317	510,421	521,803	535,154
(Y-o-Y growth rate)	8.5%	1.9%	0.9%	0.8%	0.9%	1.0%	1.4%	2.2%	2.6%

(Unit: ¥billion, real values are chain linking method from 2000)
Source: Research Institute of Construction and Economy (RICE)

Today, the Japanese economy is facing serious challenges as it strives to adapt to world trends, such as the onset of an aging society combined with a falling birthrate, rapid globalization, and the worldwide dissemination of information technology. To meet these challenges and continue to achieve economic growth, Japan must promote the efforts described in the Basic Policies for Economic and Fiscal Management and Structural Reforms 2007. Specifically, “comprehensive efforts to increase productivity,” “efforts to open up the Japanese economy,” and “efforts to create an infrastructure that can support people’s lives in the future.” It is also important to accelerate the pace and increase the depth of reforms aimed at strengthening Japan’s capacity for growth.

2.2 Major Economic Indicators

Figure 2　List of Major Economic Indicators

	2002	2003	2004	2005	2006	2007
GDP and Its components (monetary unit: ¥ billion)						
GDP (real value, FY)	507,015	517,715	527,827	540,430	551,755	563,012
GDP growth rate (%, FY)	1.1%	2.1%	2.0%	2.4%	2.1%	2.0%
GDP (nominal value, FY)	489,875	493,748	498,275	503,317	510,421	521,803
GDP (nominal value, calendar yr.)	49,131	49,029	49,833	50,134	50,765	—
Total production, agriculture, forestry, and fisheries industry, mining industry	901	884	853	800	—	—
Growth rate (%)	-0.9%	-1.9%	-3.5%	-6.2%	—	—
Total production, manufacturing industry	10,127	10,276	10,541	10,520	—	—
Growth rate (%)	-2.7%	1.5%	2.6%	-0.2%	—	—
Total production, construction industry	3,389	3,233	3,295	3,170	—	—
Growth rate (%)	-4.6%	-4.6%	1.9%	-3.8%	—	—
Service industry	34,713	34,636	35,143	35,644	—	—
Growth rate (%)	-0.5%	-0.2%	1.5%	1.4%	—	—
Demographic indicators						
Population (thousands)	127,486	127,694	127,787	127,768	127,770	127,730
Rate of population growth (%)	0.13%	0.16%	0.07%	-0.01%	0.00%	-0.03%
Labor force population (thousands)	6,689	6,666	6,642	6,650	6,657	6,542
Labor force population growth rate (%)	-0.93%	-0.34%	-0.36%	0.12%	0.11%	-1.73%
Unemployment rate (%)	5.4%	5.3%	4.7%	4.4%	4.1%	4.0%
Monetary and financial indicators						
Short-term interest rate (%)	0.10	0.05	0.03	0.04	0.26	0.6
Long-term interest rate (%)	1.007	1.380	1.445	1.456	1.634	1.650
Consumer price index (%)	100.6	100.3	100.3	100.0	100.3	100.4
Short-term prime rate (%)	1.375	1.375	1.375	1.375	1.625	1.875
Long-term prime rate (%)	1.65	1.7	1.55	1.85	2.35	2.25
Avg. US dollar exchange rate	125.31	115.93	108.19	110.22	116.12	123.16

Source: Construction Economy Estimates (RICE, July 2007), Annual Report on National Accounts (Cabinet Office, July 2006). Websites of the Ministry of Internal Affairs and Communications and Bank of Japan, Financial and Economic Statistics Monthly (Research and Statistics Department, Bank of Japan, July 2006).

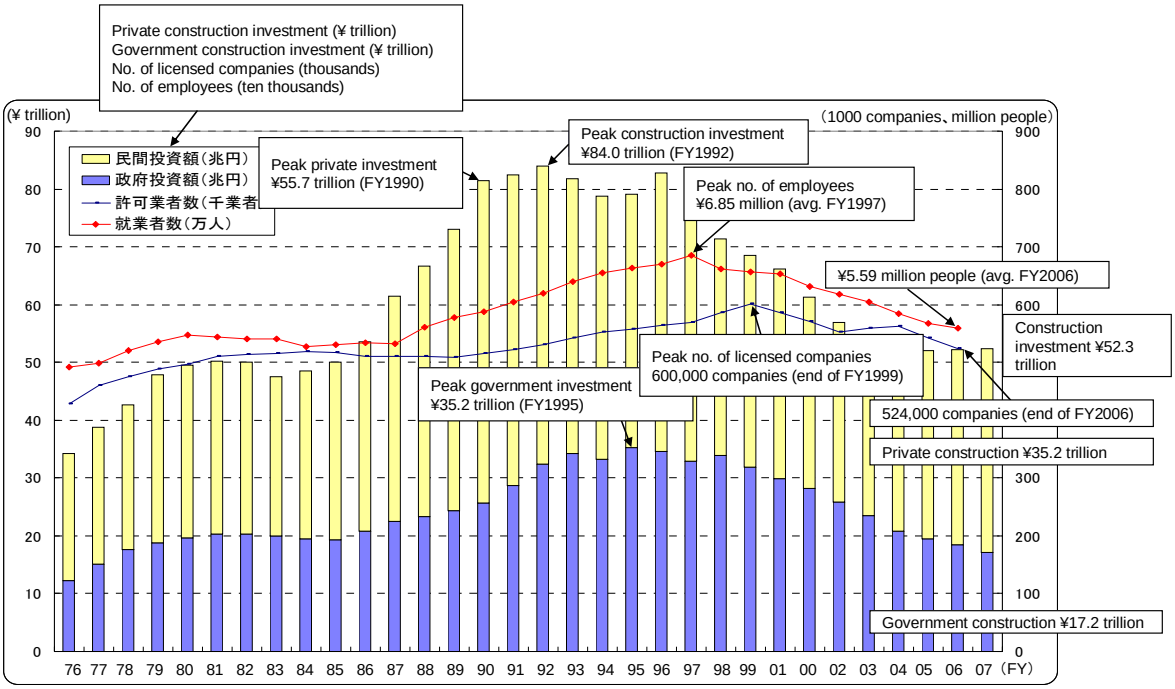
1. GDP figures for fiscal 2007 are estimates. Real figures use fiscal 2000 prices.
2. All total production figures are nominal figures for the calendar year.
3. Population figures are as of October 1 each year. The fiscal 2007 figure is an estimate.
4. The working population and unemployment rate figures are for October. Figures for 2007 are as of May.
5. The consumer price index is based on 2005 as 100.
6. Interest rates in 2007 are as of the end of May. Others reflect the year-end rates.
7. Short-term interest rates reflect the domestic average offering rates on commercial paper.
8. Long-term interest rates reflect the long-term (10-year) national bond applicant rate.
9. The consumer price index for 2007 is as of the end of May.
10. Standard loan rates (commercial banks) use the short-term prime rate.
11. Standard loan rates (finance companies) use the long-term prime rate.
12. Exchanges rates are annual averages, except for 2007, which is the rate as of the end of June.

Chapter 3: Overview of the Construction Industry

3.1 Construction Investment

Construction investment figures in Japan (figures shown hereafter are nominal) were slightly up in fiscal 2006 versus the previous year, but the situation remains tenuous. Construction investment in fiscal 2006 was valued at ¥52.3 trillion yen, of which ¥18.4 trillion consisted of government spending and ¥33.9 trillion of private spending. Total construction investment was down 37.7% compared with the peak year (indicated in parentheses, fiscal 1992), while government investment was down 47.6% (fiscal 1995) and private investment was down 39.2% (fiscal 1990). Recent trends in construction investment show that while government investments are consistently declining, private investments are rising.

Figure 3　Trends in Construction Investment (Lower left: Government construction investment; Lower right: Private construction investment)



Source: Construction Investment Forecast and Study of the Numbers of Licensed Companies, MLIT
Notes:
1. Investments shown are actual figures up to fiscal 2004. Figures for fiscal 2005 and 2006 are estimates, and figures for FY2007 are projections.
2. The number of licensed companies reflects the number at the end of each fiscal year (as of the end of March in the following year)
3. The number of employees is the annual average.

Source: Materials prepared by the Construction Industry Policy Research Materials Council, MLIT

RICE estimates the construction investment figures for fiscal 2007 and 2008 as follows (announced July 2007). Construction investment in fiscal 2007 is expected to decrease by 0.8% from the previous year to ¥51.8 trillion. Government construction investment is expected to continue to decline for the ninth consecutive year, sliding 7.5%. Private residential investment is expected to rise for the fourth consecutive year, rising 1.3%. Private non-residential construction investment is expected to increase 4.7% overall, reflecting a 4.0% increase in private civil engineering and a 5.2% increase in private non-residential building investment.

Construction investment in fiscal 2008 is expected to decrease 1.1% from the previous year to ¥51.3 trillion. Government construction investment is expected to continue its decline, by 7.4% over the previous year. Growth in private residential construction investment is expected to slow compared to the previous year, with only a 0.3% increase anticipated. Private non-residential construction investment is expected to show an overall increase for the fifth consecutive year, by 4.2%, reflecting a 3.1% increase in civil engineering and a 4.8% increase in private non-residential building investment.

Figure 4　Construction Investment Estimates

FY	1990	1995	2000	2003	2004	2005 (Estimated)	2006 (Estimated)	2007 (Projected)	2008 (Projected)
Nominal construction investment	81.4	79.0	66.2	53.7	52.8	52.1	52.3	51.8	51.3
(Y-o-Y growth rate)	11.4%	0.3%	-3.4%	-5.5%	-1.7%	-1.2%	0.3%	-0.8%	-1.1%
Nominal government construction investment	25.7	35.2	30.0	23.5	20.8	19.5	18.4	17.1	15.8
(Y-o-Y growth rate)	6.0%	5.8%	-6.2%	-9.4%	-11.5%	-6.0%	-5.6%	-7.5%	-7.4%
(Contribution to GDP)	2.0	2.5	-2.9	-4.3	-5.0	-2.3	-2.1	-2.6	-2.4
Nominal private residential construction	25.7	24.3	20.3	17.9	18.4	18.4	19.1	19.3	19.4
(Y-o-Y growth rate)	9.3%	-5.2%	-2.2%	-0.3%	2.6%	0.3%	3.6%	1.3%	0.3%
(Contribution to GDP)	3.0	-1.7	-0.7	-0.1	0.9	0.1	1.3	0.5	0.1
Nominal private non-residential construction	30.0	19.5	16.0	12.3	13.6	14.2	14.8	15.4	16.1
(Y-o-Y growth rate)	18.4%	-1.8%	0.7%	-4.9%	10.5%	3.9%	4.1%	4.7%	4.2%
(Contribution to GDP)	6.4	-0.4	0.2	-1.1	2.4	1.0	1.1	1.3	1.3
Real construction investment	84.0	77.7	66.2	54.8	53.3	52.0	51.2	50.0	48.8
(Y-o-Y growth rate)	7.6%	0.2%	-3.6%	-6.1%	-2.8%	-2.3%	-1.7%	-2.2%	-2.4%

(Unit: ¥trillion, real values are based on fiscal 2000 prices.)

1. Figures up to fiscal 2006 are from the FY2007 Construction Investment Forecast issued by the MLIT.
2. Private non-residential construction investment = private non-residential building investment + private civil engineering investment.

Source: RICE

3.2 Construction Companies

A breakdown of Japanese construction companies by size (number of employees) reveals that of the 270,000 construction companies that implement ¥1 million or more in construction projects annually, one-third have fewer than 10 employees, and 99% have fewer than 100 employees. Small and medium sized companies clearly make up the vast majority of construction companies. Comparing these figures to those from fiscal 1994 reveals that while the total number of companies in the construction industry has decreased by about 30,000 over the past decade, there has been virtually no decrease in companies with fewer than 10 employees. Thus the weight of those companies has effectively increased in the market place.

Figure 5　Number of Construction Companies by Size (No. of Employees) in FY1994, 2004

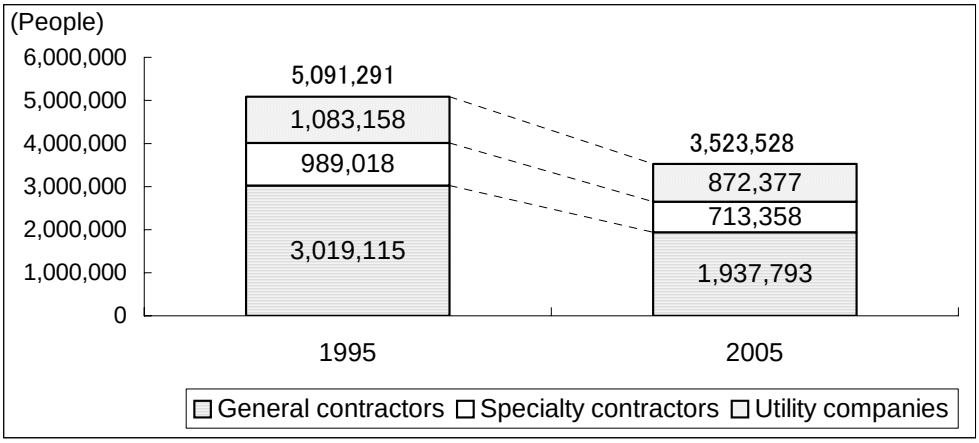
	FY1994			FY2004		
No. of employees	No. of companies	Ratio	Cumulative	No. of companies	Ratio	Cumulative
1-9	168,637	55.7%	55.7%	168,298	61.5%	61.5%
10-99	126,334	41.7%	97.4%	99,443	36.4%	97.9%
100-999	7,216	2.4%	99.7%	5,233	1.9%	99.8%
1,000 or more	785	0.3%	100.0%	543	0.2%	100.0%
Total	302,972			273,517		

Source: Report on the Survey of Construction Project Statistics, MLIT

3.3 Employees and Construction Labor

The numbers of construction industry employees by occupation shows that 1,937,793 (55.0%) work for general contractors, 713,358 (20.2%) work for specialty contractors, and 872,377 (24.8%) work for utility companies, for a total of 3,523,528 (100%) employees. This total is down 1.5 million from fiscal 1995, reflecting a particularly large decrease in the number of general contractors.

Figure 6　Number of Construction Industry Employees by Occupation in 1995,



	1995		2005	
General	3,019,115	59.3%	1,937,793	55.0%
Specialty	989,018	19.4%	713,358	20.2%
Utility	1,083,158	21.3%	872,377	24.8%
Total	5,091,291	100.0%	3,523,528	100.0%

Source: Report on the Survey of Construction Project Statistics, MLIT

3.4 Productivity

Against the backdrop of a rapid decline in construction investment, labor productivity in the Japanese construction industry has continued to drop since the early 1990s. The factors involved in this decline are listed below, and include macroeconomic factors such as the decline in construction investment, as well as micro level productivity impediments at work sites and within companies.

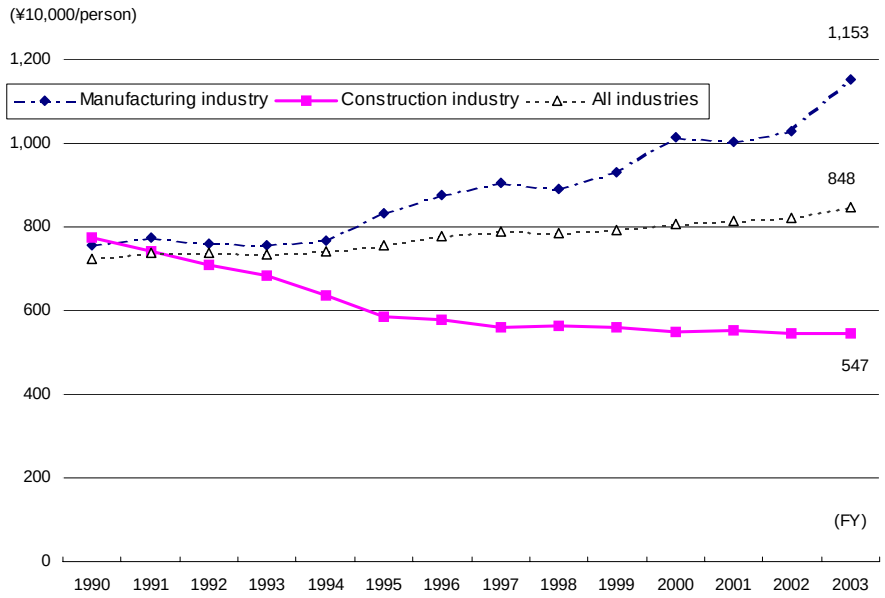
(1) Although construction investment has begun a dramatic decline, the construction industry has played the role of providing employment as a pump-priming measure. Thus, the industry carries relatively high employment in spite of the decrease in construction investment.

(2) Production continues to occur outdoors, on individual projects, and on a build-to-order basis. Adequate measures have not been taken to improve workplace productivity and bring about significant reforms in the production system in this industry.

(3) The ratio of employees in indirect work sectors is increasing due to the rise in the number of construction companies, a result of past pump-priming measures.

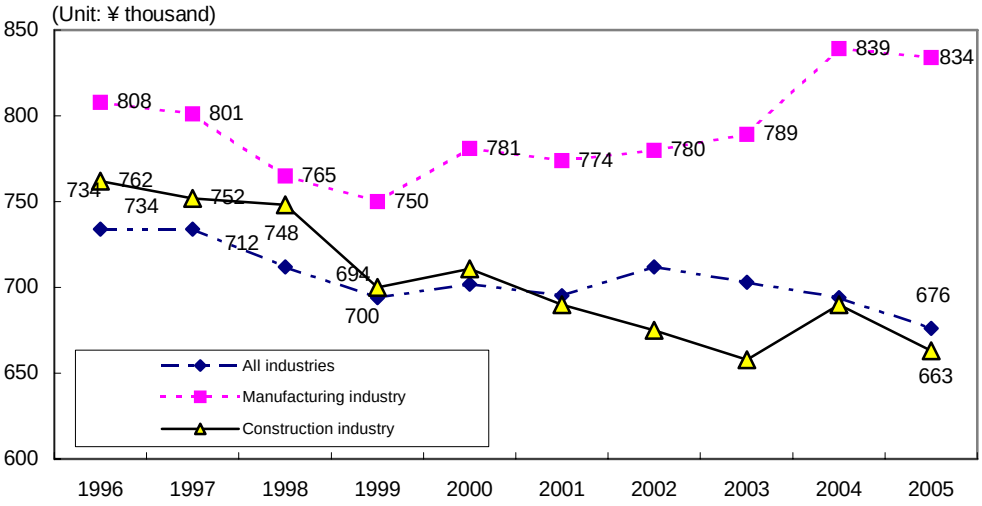
(4) The production system is inefficient, with too many layers of subcontractors and increasing costs.

Figure 7　Trends in the Real Labor Productivity in the Construction Industry



Note: Real labor productivity = GDP by economic activity as reported in the national accounts (real) /
No. of employees engaged in each economic activity.
Source: Prepared by RICE using the 2005 Comparison of Productivity by Industry, Japan Productivity Center for Socio-Economic Development.

Figure 8　Value Added Per Employee



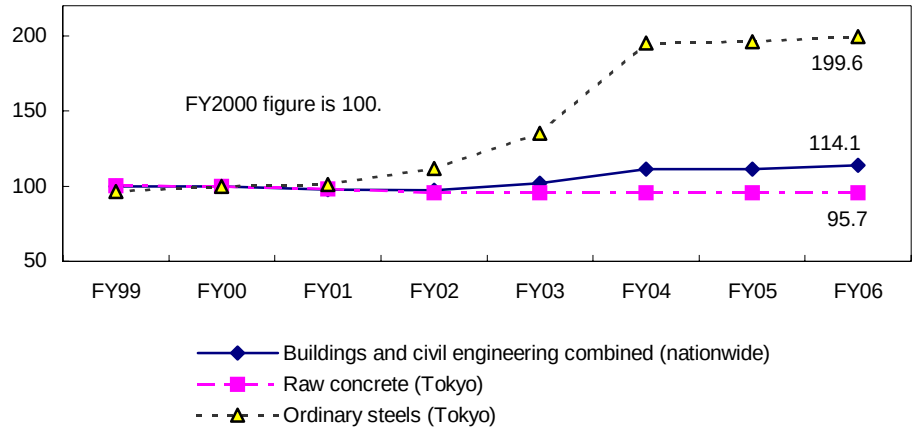
Note: Value added = operating income + personnel expenses + interest expenses, discount expenses + taxes and public fees, etc.
Source: Corporate statistics.

3.5 Construction Costs

(1) Average Construction Material Prices

Figure 9 shows an index over price trends of major materials, which is based on average prices in fiscal 2000 (construction material price index). The nationwide index combining building and civil engineering has been increasing slightly since fiscal 2003. This is largely due to high worldwide steel prices. The price of ordinary steels soared in fiscal 2003 and fiscal 2004, and prices have continued to remain at high levels even after the increase slowed. Raw concrete, on the other hand, has slightly decreased.

Figure 9　Trends in the Construction Material Price Index

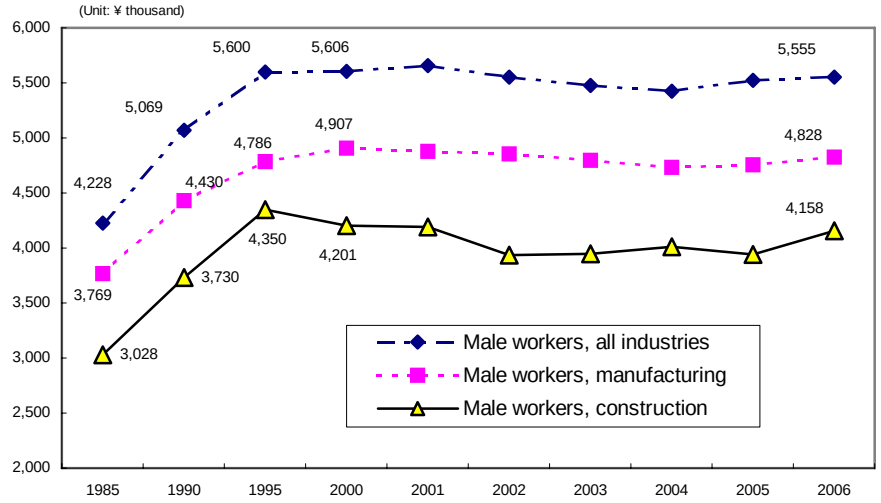


Source: Economic Research Association

(2) Construction Industry Wages

The wages of production workers in the construction industry increased significantly up until the early 1990s, and the gap between wages in the construction and other industries, such as the manufacturing industry, was closing. However, construction industry wages began to fall sooner than wages in other industries, and they fell further, thereby causing a wider wage gap. Wages increased significantly year-on-year in fiscal 2006, but at ¥670,000 annually, they were still 13.9% lower than the manufacturing industry.

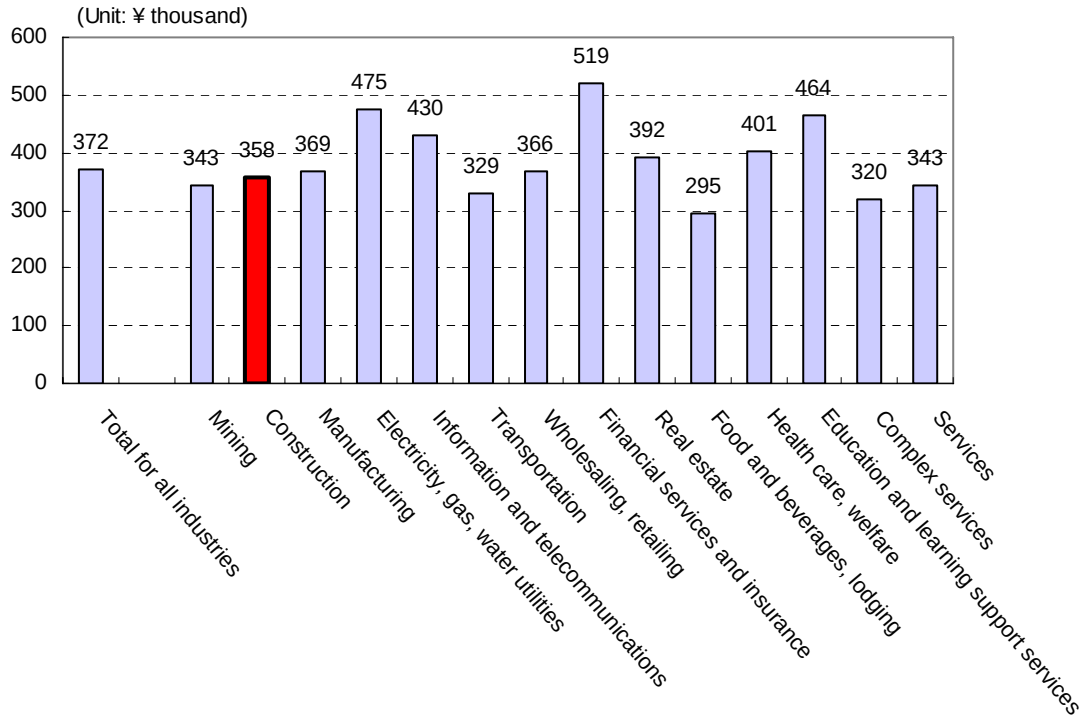
Figure 10　Trends in Total Annual Wages Among Production Workers



Source: Basic Statistical Survey of Wage Structures, Ministry of Health, Labour, and Welfare

Figure 11 shows the monthly wages by industry among male workers (salaries based on monthly wages, not including bonuses). While the monthly average for all industries was ¥372,000, the construction industry monthly wage was ¥358,000, 4% lower than the average.

Figure 11　Monthly Salary by Industry (Males, fiscal 2005)



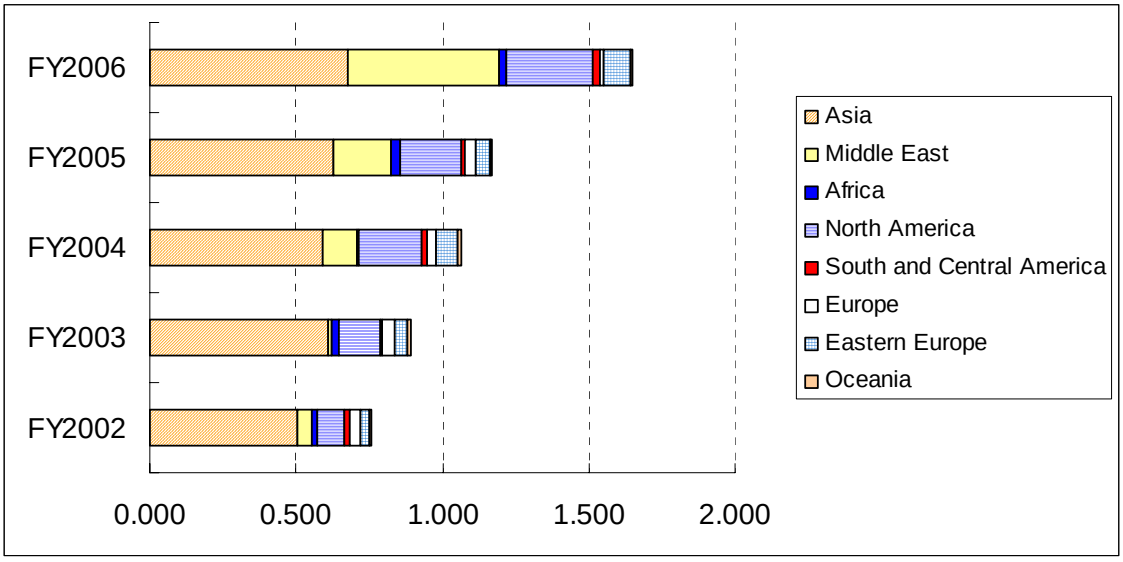
Source: Basic Statistical Survey of Wage Structures, Ministry of Health, Labour, and Welfare

3.6 Overseas Expansion of the Japanese Construction Industry

Overseas construction orders have lingered at the ¥1 trillion level for more than 20 years since the ¥1 trillion threshold was first crossed in fiscal 1983. In fiscal 2006, they reached the highest level ever, hitting ¥1.648 trillion. The ratio of the overseas to the domestic market has grown in recent years, hitting the 3% range in fiscal 2006. Orders from the Middle East, which has seen a surge in construction, increased 2.6 times over the previous year.

Figure 12　Overseas Construction Orders in FY2002-2006

(Unit: ¥ trillion)



	FY2002	FY2003	FY2004	FY2005	FY2006
Asia	0.502	0.611	0.589	0.630	0.677
Middle East	0.053	0.011	0.117	0.194	0.514
Africa	0.018	0.023	0.011	0.030	0.024
North America	0.093	0.142	0.210	0.209	0.299
South and Central America	0.014	0.006	0.020	0.016	0.024
Europe	0.041	0.048	0.032	0.033	0.013
Eastern Europe	0.026	0.039	0.077	0.050	0.092
Oceania	0.010	0.015	0.007	0.007	0.005
Total	0.758	0.894	1.062	1.171	1.648

Source: Overseas Construction Association of Japan

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Creating Innovation in the Construction Industry

2007

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Creating Innovation in the Construction Industry

I. Overview

Looking ahead towards the impending decline in the population, the result of an aging society combined with a falling birthrate, Japan is striving to create innovative new possibilities and inspire new vitality in the socioeconomic arena. The construction industry is using information and communication technology (ICT), the tools of innovation, to further develop construction production systems and to improve the networking capabilities of the construction industry, as described below. The industry is:

(1) Developing electronic commerce transaction systems (structures for exchanging the estimates and order sheets needed for placing and accepting orders) using the Construction Industry Network (CI-NET), a standard for the exchange of electronic data formulated in cooperation with the construction industry. The industry is also furthering the digitization of the public works ordering process through the Continuous Acquisition and Life-cycle Support/Electronic Commerce system, CALS/EC.

(2) Promoting facility maintenance using IC tags.

(3) Concentrating the tasks conducted by individual companies, such as customer service, design, material procurement, and project management over the Internet, and promoting collaboration between small and medium-sized construction companies using local information networks.

The industry is striving to measure natural disaster information in real time using IC tags, and to work with broadcast media to share accurate disaster prevention and damage information via mobile phone networks. The industry is also determined to achieve a safe transportation structure by further developing intelligent transportation systems (ITS) that enable vehicles and infrastructural components to communicate with one another. Innovations like these have the potential to significantly change people’s everyday lives. It is essential that the construction industry see these developments as new business opportunities, that it stays up-to-date with technological innovations in ICT and other sectors, that it takes the socioeconomic situation into account, and that it aggressively takes advantage of rising opportunities.

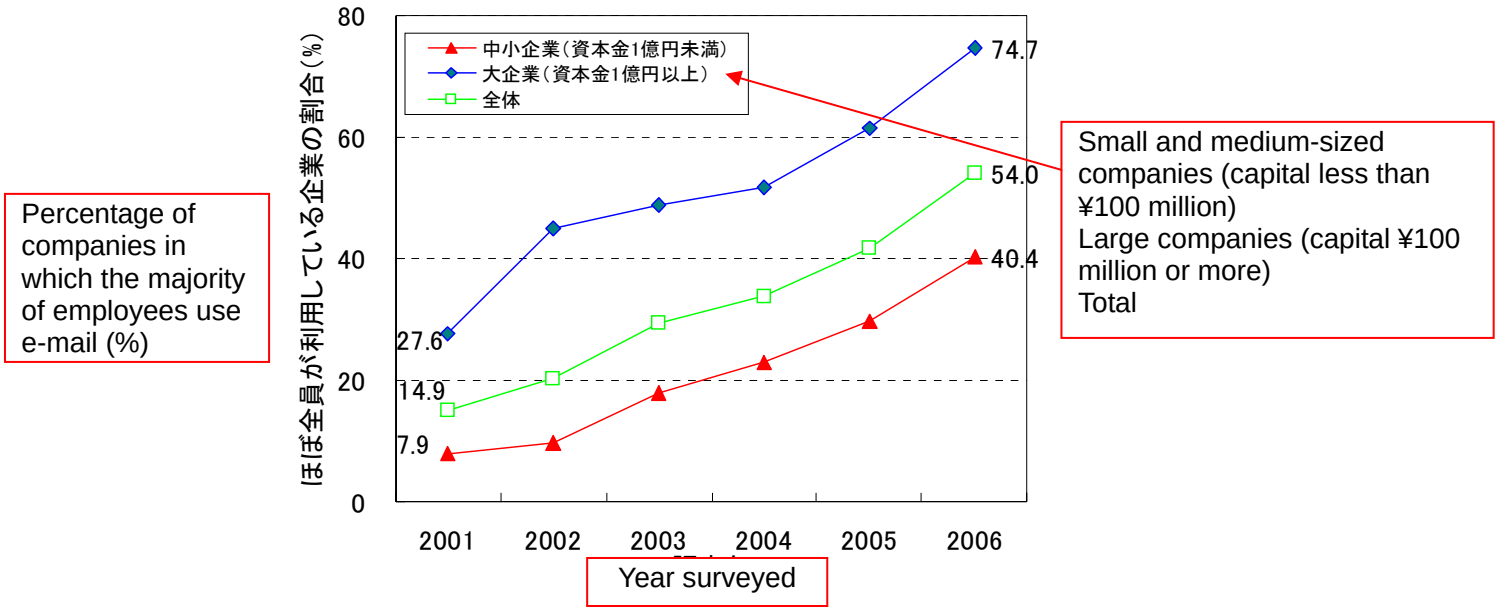
II. Innovation in the Construction Industry

Today, Japan is facing a serious decline in the population due to an aging society and falling birthrates. It is therefore extremely important that the construction industry discovers and creates new possibilities, inspires new vitality in the socioeconomic arena, and achieves sustainable development despite the population decline. One way to do this is to recognize that innovation means using new technology to reform and renovate social systems and the entire institutional structure, thereby allowing the consistent production of new value. Japan's effort to achieve such innovation is evidenced by the establishment of the Innovation Promotion Headquarters within the cabinet.

Information and communication technology (ICT) is expected to play a major role in the future, serving as an important tool of innovation. In response to the rapid development and dissemination of information-related technology, Japan is promoting the expanded use of ICT. The government established the IT Promotion Headquarters within the cabinet in January 2001, and has since then been promoting the e-Japan strategy, as well as its more developed version, the u-Japan strategy, and a series of plans to implement both.

It is against this backdrop that the construction industry has been trying to expand the use of ICT. Although progress is being made at different rates depending on the size of the company, efforts to expand the use of ICT in the construction industry are steadily moving forward. For example, in 2006, the majority of employees used e-mail in 74.7% of large companies (with capital of ¥100 million or more) and 40.4% of small and medium-sized companies (with capital of less than ¥100 million). These percentages are steadily rising. Also, although the construction industry is lagging behind other industries, efforts to use electronic forms of transaction, such as electronic bidding, are moving forward. 89.9% of companies now have an electronic bidding system.

Figure 1　Percentage of companies in which the majority of employees use e-mail



Source: Research Institute of Construction and Economy (RICE)

The use of IT by service providers can improve operational efficiency and reduce costs. For service consumers, it can increase the value-added of the services they consume and contribute to improved customer satisfaction. The construction industry in Japan tries to use IT in every stage of its business operations, including sales activities, design and estimate calculations, the receiving and placing of orders, material procurement, project implementation, and maintenance activities. The construction industry also strives to develop more advanced construction production systems, and to improve its networking capabilities. The following sections will provide several examples of how innovation is being achieved in the construction industry through the use of IT. These examples will be divided into those related to construction industry policy and those that reflect the ambitious and creative efforts of private companies.

1. Promoting the Use of IT Through the Development of Common Platforms

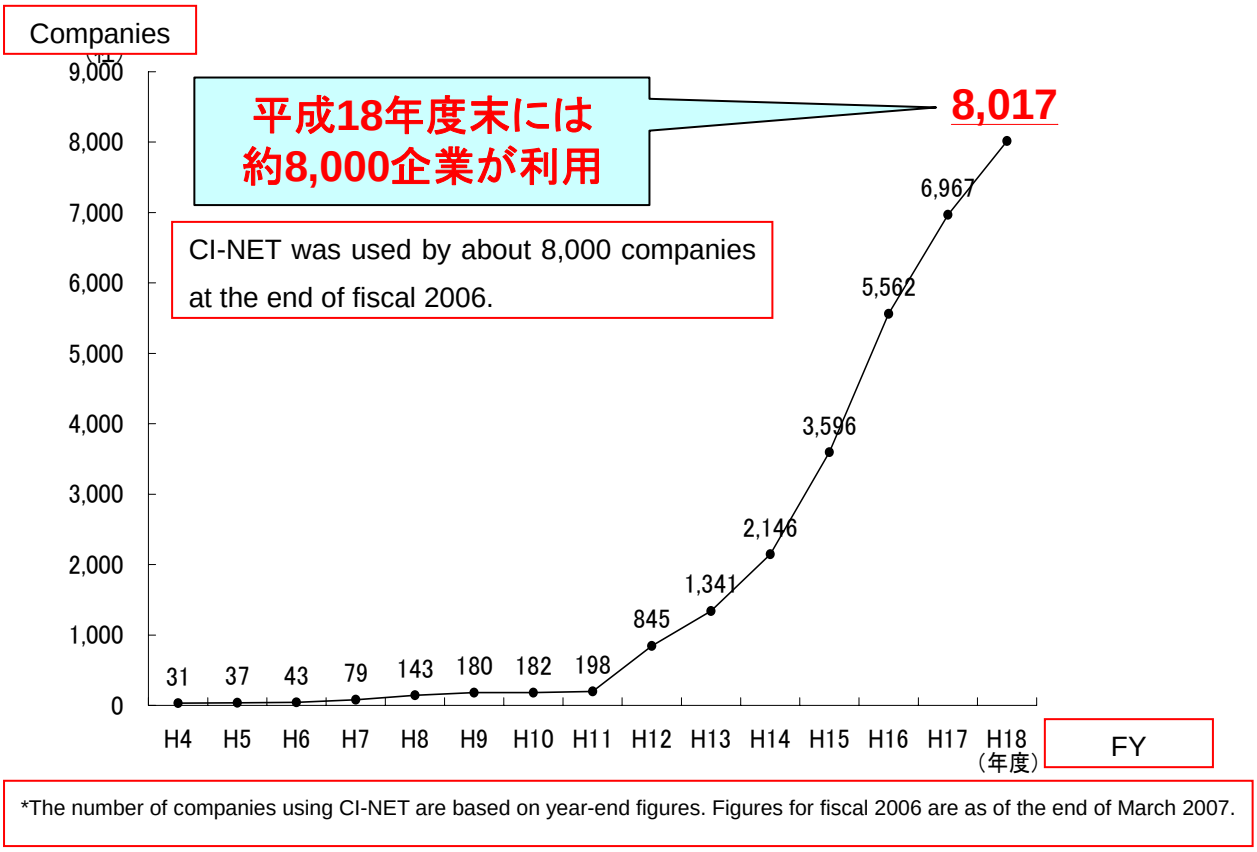
(1) Development of the Construction Industry Network (CI-NET)

It is important to avoid problems that can arise from a lack of compatibility between electronic commerce services, such as redundant investments and administrative complications resulting from the installation of multiple terminals by our business partners. Toward this end, the Ministry of Land, Infrastructure and Transport (MLIT) adopted the Guidelines Regarding the Cooperative Use of Computers in the Construction Industry in 1991. Based on these guidelines, the

Fund for Construction Industry Promotion worked in cooperation with construction companies to formulate standards for electronic data interchange in the construction industry (CI-NET). These standards stipulated standardized information exchange procedures and agreements for electronically exchanging accounting data, such as estimates and orders sheets, between construction companies. They covered such details as the procedures for transmitting purchase orders and order receipts, data formatting, and product codes. At the end of March 2007, as many as 8,017 companies were participating in CI-NET. The use of CI-NET makes it possible for companies to electronically exchange relevant documents and technological information, using common procedures and methods, with other CI-NET-participating companies. This reduces the costs associated with the documentary stamp tax, document production, and delivery, and improves management efficiency by providing numerical data that can be utilized in cost control measures. It is also expected to create efficiencies related to the promotion of more systematized relationships with subcontractors, which are often not governed by written contracts.

With the environment for electronic transactions between construction companies becoming more developed, the five leading construction companies; Kajima Corporation, Taisei Corporation, Shimizu Corporation, Obayashi Corporation, and Takenaka Corporation, in partnership with NTT Data Corporation and Oracle Corporation Japan, established Construction-ec.com Co., Ltd. Using CI-NET, Construction-ec.com offers an ASP service known as “CIWEB.” The system has 6,209 companies that receive orders (as of March 31, 2007), and facilitated 133,598 contracts in fiscal 2006.

Figure 2　Trends in the number of companies using CI-NET



*The number of companies using CI-NET are based on year-end figures. Figures for fiscal 2006 are as of the end of March 2007.

(2) Promoting the digitization of administrative tasks related to public projects (CALS/EC)

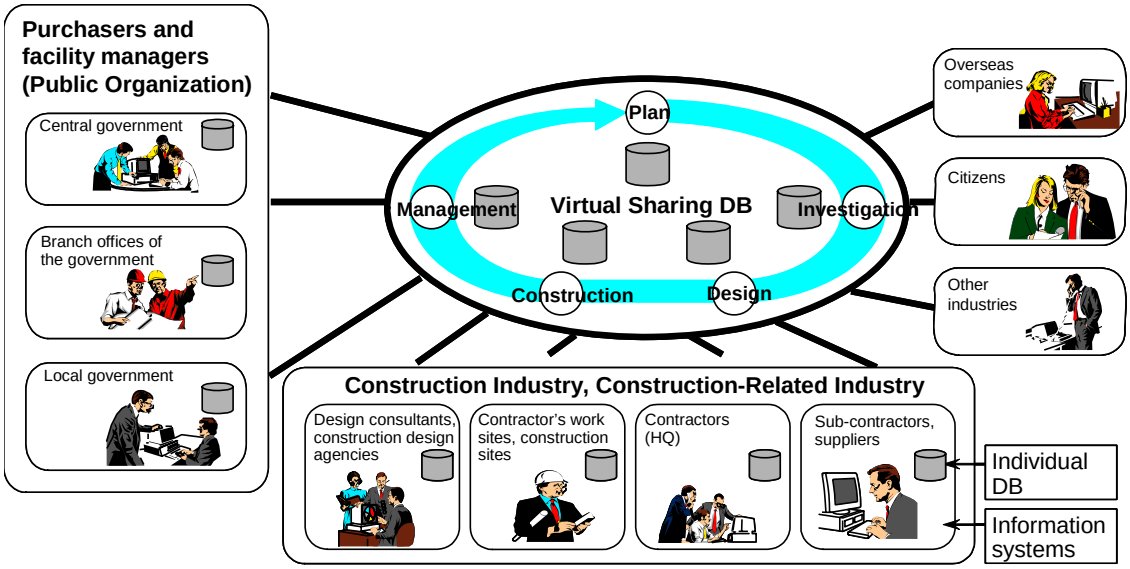
The Ministry of Land, Infrastructure and Transport (MLIT) formulated the Basic Concept Regarding the Development of the Construction of CALS/EC, and is promoting the Continuous Acquisition and Life-cycle Support/Electronic Commerce (CALS/EC) system, a comprehensive information system for supporting public works projects. CALS/EC uses digital information technology in public works projects to achieve electronic bidding (a structure in which bidders can participate in the bidding process over the Internet), electronic contracts (a structure for concluding contracts using internal computer networks or the Internet) and electronic delivery (a structure for delivering results in electronic files). CALS/EC also enables electronic acceptance, which prevents fraudulent bids and modifications to bid content, thereby ensuring the safety of transactions done over the Internet. The system is designed to improve and promote the efficiency of document and information exchange between parties involved in public works projects, thereby improving the quality.

The MLIT has promoted CALS/EC by developing a specific Action Program based

on the basic concept and trends in the e-Japan strategy. The CALS/EC Action Program was formulated in March 2006 with a target implementation date of March 2008. It includes 18 goals, such as “improving the efficiency of procurement procedures through the distribution of bidding information over the Internet.” The CALS/EC approach is gradually being adopted for projects that are directly managed by the MLIT.

In fiscal 2006, 36,920 of the approximately 40,000 bids (or nearly 90%) for both national construction and administrative projects were handled electronically. However, electronic bidding at the municipal level had only been implemented by 22% of municipalities as of June 2007. Introducing electronic bidding among local public organizations, particularly municipal governments, is the next challenge to be addressed.

Figure 3　CALS/EC Conceptual Diagram



2. IT-Derived Innovations by Companies in the Construction Industry

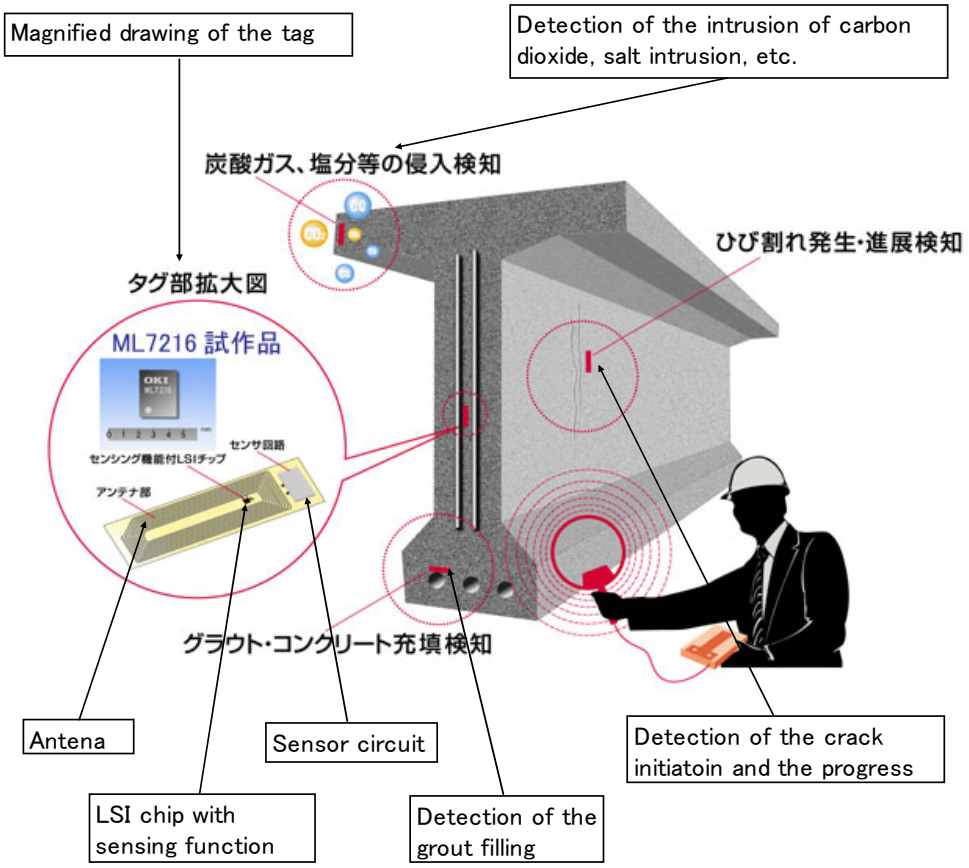
(1) Facility maintenance and management using IC tags

Because much of the social capital built in Japan after World War II is now facing the need for renovation, efficient facility maintenance is a key factor in decreasing life-cycle costs. There are great expectations for innovations in this area.

Company A has built a system in which it embeds IC tags (radio frequency identification, RFID, tags) into its concrete structures. The IC tags allow the company to check conditions such as grout filling, the appearance and growth of cracks, and the penetration of carbon dioxide gas and salt, after the structures

have been built, without having to destroy them. The RFID is a passive tag that is not battery-operated, and is equipped with a large-scale integration (LSI) chip. Inspection results are recorded in the rewritable memory of the LSI chip, and a read and write device can be used to obtain information from the electromagnetic waves emitted from the RFID.

Figure 4　Diagram of facility maintenance and management using IC tags



http://www.oki.com/jp/Home/JIS/New/OKI-News/2005/06/z05019.html

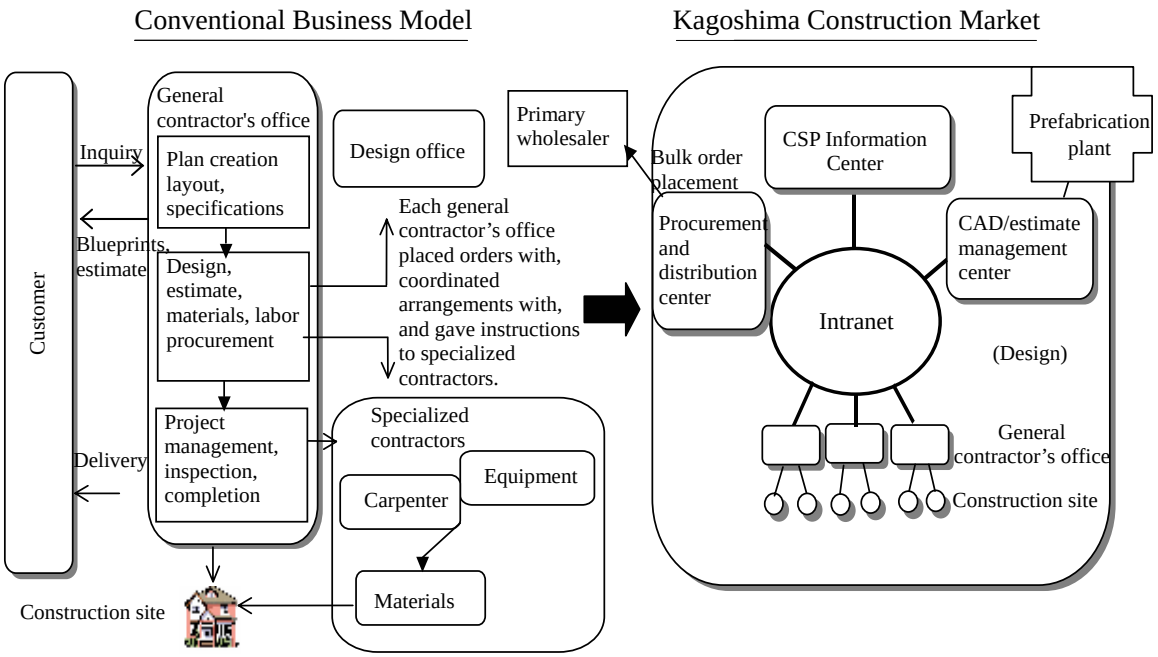
The advantages of this system are as follows. When expressway management corporations (taking over the responsibilities of the Japan Highway Public Corporation) perform construction work on bridge piers, they insert a wire to confirm the chemical grouting status of the structure. After the chemical grouting status has been confirmed, the wire is cut off, leaving a portion of the wire embedded in the mortar. However unlikely, it is possible for moisture to penetrate the structure from this location,. Also, once this wire is cut off, it becomes impossible to ascertain the level of deterioration of this section later. This new system is superior to the wire method insofar as it does not allow the penetration of moisture and because the RFID can be used for about 10 years. At present, the

RFID system is not in use because it costs about twice that of the wire method. However, if further efforts are made to promote the u-Japan strategy (a more developed version of the e-Japan strategy promoted by the Ministry of Internal Affairs and Communications) and to expand the use of RFID tags, and if the devices become mass-produced, the costs will drop. This would make the implementation of this system more practical.[1]

(2) Promoting collaboration among small and medium-sized companies
Sensing the tough economic environment and the need to improve both management efficiency and customer satisfaction, 150 small and medium-sized general contractor's offices and specialized contractors in Kagoshima Prefecture have launched a collaborative project using IT to form a local information network. The multiple tasks that were once handled by each general contractor's office, such as customer service, estimating services, design work, placing orders with specialized contractors, material procurement, and project management, are now being assigned to separate centers established to perform a single function. Under this system, these centers are connected via an intranet and the network members can view blueprints, specifications, construction schedules, and procurement information over the Web. This system has allowed the joint purchasing of equipment and materials, the sharing and integration of estimation procedures, and the introduction of CAD design services, which are often difficult for small and medium-sized contractor's offices to offer. This has led to a dramatic increase in efficiency. Also, Web cameras have been installed at construction sites, allowing offices to get an overview of construction progress in real time. This has significantly reduced the preparation time needed by specialized contractors, resulting in an increase in both work efficiency and productivity. Specifically, the average construction period has been shortened from 90 days to 60 days. Costs have likewise been reduced from ¥420,000 per *tsubo* (a unit of land measurement equivalent to about 3.95 square yards) to ¥320,000 per *tsubo*.

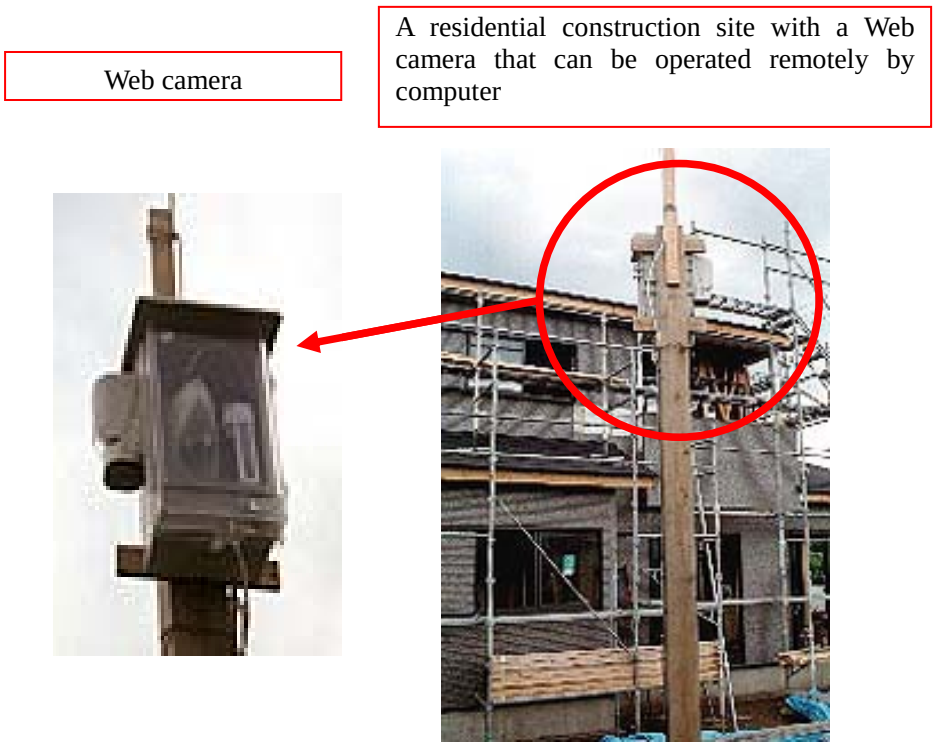
[1] The "u" in the u-Japan strategy has three meanings: (1) Ubiquitous: Information networks can be accessed any time, anywhere, by anyone, for any purpose. (2) Universal: Networks can be universally used by anyone. (3) Unique: Networks are unique systems. By 2010, the u-Japan strategy envisions the use of RFID tags in systems where, for example, an RFID is placed in a refrigerator, allowing the consumer to ascertain what items are in their refrigerator from their mobile phones before they go shopping.

Figure 5　Diagram of the Kagoshima Construction Market Business Model



Source: *Promoting e-Construction Management Among Small and Medium-Sized Companies*, Research Institute of Construction and Economy (March 2004).

Figure 6　Residential construction site with a remotely operated Web camera



Source: Kagoshima City (http://www.minaminippon.co.jp/kikaku/it/000915.htm)

III. Future Projections and Conclusions

Needless to say, information and communication technology (ICT) is expected to play a major role in the construction industry by serving as an important tool in promoting innovation. ICT not only has significant potential in terms of its ability to overcome geographical and spatial restrictions by transcending time and distance, but also has the inherent potential, by virtue of the extremely fast pace at which technological innovation occurs, to dramatically change existing social structures and lifestyles in a very short period of time.　Japan is becoming one of the world's leading ICT countries in terms of its infrastructural developments, such as its optical fiber network, as well as in its personal Internet usage rates. Japan will have to take full advantage of the potential offered by IT developments in the future so that it can ensure high productivity despite population decline, consistently produce new value, and find ways to solve its various socioeconomic

issues.
The MLIT announced its Innovation Promotion Outline in the Land and Transportation Fields on May 25, 2007. This outline contains examples of ICT projects that need to be promoted in the future, and a construction schedule for implementing them. Among them, the following projects will provide society with advanced disaster prevention capabilities and the world's safest transportation systems using ITS, which are related to the construction industry.

Every year, Japan experiences natural disasters such as earthquakes and typhoons that cause significant loss of life and property. To dramatically decrease this loss, an initiative using IT to raise the nation's level of disaster response capabilities is being investigated. Specific examples include:

(1) Creating a network of sensors, including IC tags to be placed in important public facilities, such as levees, breakwaters, and sewerage systems, and ensure that these are constantly monitored. Damage can thus be measured in real time and information can be collected from residents using mobile GPS devices.
(2) Combining and utilizing different monitoring technologies that take advantage of airplanes and satellites, and detecting the early signs of disasters by automatically monitoring movements in the earth's crust.
(3) Ensuring the dissemination of accurate disaster information, strengthening partnerships with broadcast media, enabling car navigation devices to provide vocal disaster information announcements, and enabling the visual monitoring of road information using mobile phones.

Several intelligent transportation system (ITS) tools, such as car navigation systems, now in 25.32 million vehicles, and electronic toll collection systems (ETC), now in 16.98 million vehicles with an average national use of 67.3%, are in widespread use. These provide a major benefit in people's lives, increasing convenience for drivers and improving the traffic environment by reducing congestion. In the future, the challenge will lie in finding ways to organically link these systems to make roads safer. For example, efforts are already underway to create a safe driving support system using collaborative infrastructural communication. One system, using an intra-auto communication system, can transmit the position of an oncoming vehicle to a car that is trying to take a right turn so as to avoid collision, while another system uses roadway-to-auto communication to provide information regarding obstructions in the roadway. These systems are being empirically tested in 2007. There are also initiatives to

use ETC technology to ease parking lot entry and exit, and to use vehicle information to settle transactions by credit card. Vehicles and the infrastructure are being linked through information technology, and this is creating a chain reaction throughout the business world.

To promote these kinds of innovations, national and local government bodies, industrial experts in the construction industry and other sectors, and experienced scholars need to work closely to construct common foundations that can keep up with rapid developments in ICT. As this happens, various parties will make efforts aimed at promoting innovation. It is particularly important that the construction industry recognize these developments as new business opportunities, that it watch for technological innovations in ICT and other sectors while also keeping an eye on the socioeconomic situation as a whole, and that it aggressively take advantage of opportunities as they arise. These innovations have applications for overcoming the challenges that all nations face, such as improving disaster response and traffic safety. It is therefore important that efforts be made to share this information with people around the globe.