

Construction Economy and Innovation in Korea

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Prepared By

Jae-Yoon Yoo

Hyuk Moon



1591-6 Kwanyang-Dong, Dongan-Gu
Anyang-Shi, Kyounggi-Do 431-712, Korea
jjyu@krihs.re.kr; hmoon@krihs.re.kr

Tel: 82-31-380-0268~9, 82-31-380-0386

Korea Research Institute for Human Settlements

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PART I

Korean Economy and Construction Industry

1. Macro Economic Review and Outlook

1.1 Main Macroeconomic Indicators

1.1.1 Overview of National Economy

Korean economic growth remained generally moderate, following slowdowns since the first quarter of 2006. Industrial production has continued to decrease since the second half of last year, while service production in close relation with domestic demand showed a modest improvement. Production in semiconductor and IT sectors that has been a driving force of the growth for the past several years fell sharply since late year, contributing to the downturn of the overall industrial production growth. On the other hand, the service production growth rate closely related to domestic demand appears to gradually come out of its sluggish performance that has continued since early last year.

Exports growth remained robust and domestic demand has moderately improved since mid-2006. The pace of export continued to experience double-digit growth, increasing about 15% on average from January throughout April, but there was no sign of further acceleration.

As for domestic demand, investments have been increasing since the second quarter of 2006, while consumption for the first quarter of 2007 expanded at a modest pace. Despite low investment in transportation equipments, investment in machinery remained robust, and construction investment accelerated slightly led by active civil construction.

Despite slowness in the production growth since mid-2006, the fall in oil prices seemed to contribute to the recovery of domestic demand. Despite a decrease in GDP growth rate, drop in oil prices contributed to increase in real purchasing power (measured by GDI) through the improvement of terms of trade.

The downturn of the U.S. economic growth since late 2006 has not spread to other economies, while global economy shows a continued robust growth. The slower growth of the U.S economy primarily decreased to about -20%, reflecting the decline in housing prices and downturns in housing investment, However, the solid growth of Euro zone and recovery of the Japanese economy appeared to have partly offset the negative effects from the U.S. economy.

Still, there are risks found in both domestic and foreign economic environments including the oil price hike since February and the lingering instability of global economy. The rise of international oil prices is likely to act to curb further recovery of real purchasing power and domestic demand by hampering the terms of trade that has improved since the second quarter of last year. In addition, concerns over the U.S. economy has not been abated yet, and uncertainty has also remained regarding conditions in semiconductor • IT industry, which is unlikely to expect that Korea's export conditions will improve.

Cautious optimism has been dominant so far, but uncertainty has remained relating to the sufficient liquidity of the international financial market since the past several years and to the possible change in financial inflows to the U.S. market. Considering that presidential election is scheduled for late this year, cautious attention should be paid to check the increasing uncertainty on the implementation of the current economic policies. It will be important for Korea to consistently accomplish its pending issues, including KOR-US FTA, its follow-up measures, the reform of pension system, the rearrangement of welfare system, and housing market stabilization policies.

<Table 1.1.1> Main Macroeconomic Indicators (base year: 2000)

	2000	2001	2002	2003	2004	2005	2006	2007.3
GDP and Components								
GDP at real prices* (bn won)	578,644.5	600,865.9	642,748.1	662,654.8	693,995.5	723,126.8	759,234.4	183,119.5
GDP at current market prices (bn won)	578,664.5	622,122.6	684,263.8	724,675.0	779,380.5	810,515.9	847,876.4	205,226.6
GDP growth (%)	9.3	7.5	10.0	5.9	7.5	4.0	4.6	5.2
Agriculture, Forestry and Fishing	25,029.8	24,806.2	24,654.9	24,166.1	26,246.2	24,631.4	24,473.3	2,214.5
% growth	0.9	-0.9	-0.6	-2.0	8.6	-6.2	-0.6	-6.8
Mining & quarrying	2,036.9	2,020.7	2,051.4	2,062.6	2,276.5	2,626.2	2,667.9	809.6
% growth	2.8	-0.8	1.5	0.5	10.4	15.4	1.6	3.8
Manufacturing sector	151,243.0	151,766.0	161,952.0	169,145.4	198,554.3	204,701.0	209,835.4	52,280.3
% growth	13.7	0.3	6.7	4.4	17.4	3.1	2.5	4.1
Services sector	279,605.1	309,584.7	345,962.6	366,046.7	385,735.3	406,301.8	430,832.0	108,915.2
% growth	8.5	10.7	11.8	5.8	5.4	5.3	6.0	6.2
Construction sector	42,926.70	47,181.9	51,541.7	61,329.8	64,772.5	66,375.0	68,434.3	12,838.7
% growth	-1.0	9.9	9.2	19.0	5.6	2.5	3.1	6.9
Demographic Indicators								
Population (1,000)	47,008	47,353	47,622	47,859	48,039	48,138	48,297	-
Population growth rate (%)	0.83	0.71	0.62	0.59	0.57	0.19	0.33	-
Total labour force (1,000)	22,134	22,471	22,921	22,957	23,417	23,743	23,978	23,960
Labour force growth rate (%)	2.2	0.2	0.6	-0.5	0.6	-0.1	-0.1	-0.1
Unemployment rate	4.4	4.0	3.3	3.6	3.7	3.7	3.5	3.5
Financial Indicators								
Short term interest rate	7.08	5.32	4.81	4.31	3.79	3.65	4.48	4.94
Long term interest rate	8.5	6.66	6.47	4.93	4.45	4.66	5.07	4.98
Changes in consumer price index	2.3	4.1	2.8	3.5	3.6	2.8	2.2	2.2
Base lending rate (Commercial banks)	8.55	7.70	6.92	6.50	5.88	5.49	5.80	6.32
Base lending rate(Finance companies)	7.77	5.91	6.50	6.17	5.92	5.65	6.08	6.41
Change against US\$	1,259.70	1,326.10	1,200.40	1,197.80	1,043.8	1,013.0	929.6	940.3

1.1.2 Main Economic Indicators

A. Gross Domestic Product Indices

After having overcome the currency and financial crises and pulled out of the post-crisis recession, the Korean economy experienced a slowing of growth in 2001 due to the sluggish facilities investment and reduced export growth. During 2002, as domestic demand turned brisk and exports recovered rapidly, the annual growth rate rebounded. However, it decelerated significantly again in 2003 as private consumption and facilities investment were both sluggish. During 2004, the GDP growth rate rose from the previous year's 3.1 % to 4.7%.

Over the course of 2005, the Korean economy grew by 4.0% as the export growth rate slowed down owing to a base-period effect, even though private consumption and facilities investment showed a mild recovery. From the second half, however, the Korean economy recovered at a gradually increasing pace due to the balanced growth of domestic demand and exports.

Korean economy showed a relatively strong performance in 2006. The current account continued to post an underlying surplus and prices remained stable while gross domestic product (GDP) grew at an accelerated pace. The growth rate of GDP rose from the previous year's 4.2% to 5.0% as exports kept up their brisk performance and domestic demand exhibited a trend of recovery.

During the first quarter of 2007, the Korean economy saw the current account shifted into deficit, but prices showed stable trends while the growth rate maintained a level similar to that of the previous quarter. Real gross domestic product (GDP) grew by 0.9% seasonally adjusted in the first quarter, a pace similar to that of the preceding quarter. Imports shifted to a sharp rise and construction investment decelerated considerably, which counteracted the faster growth pace of facilities investment and private consumption. Real gross national income(GNI), however, decreased by 0.9%, affected by a base-period effect of its rapid growth in the previous quarter (2.5%) and the deterioration of the terms of trade.

<Table 1.1.2a> Gross Domestic Product Indices (at current prices)

	2000	2001	2002	2003	2004	2005	2006
GDP in KRW	578.6	622.1	684.2	724.6	779.3	810.5	847.8
(GDP in USD)	511.8	482.0	546.9	608.0	680.9	791.3	887.4
Annual average increase rate	8.5	3.8	7.0	3.1	4.7	4.2	5.0

(unit : KRW tril., USD bil., %)

Resource : Quarterly National Accounts, 2007, The Bank of Korea.

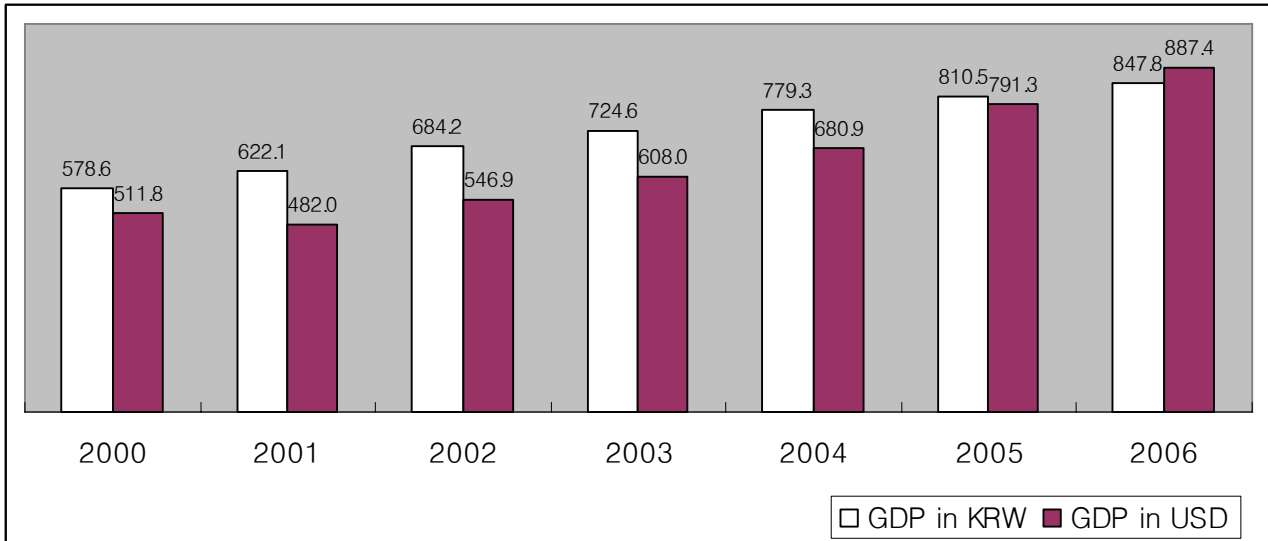


Figure 1.1.2a-1> Gross Domestic Product In KRW, USD

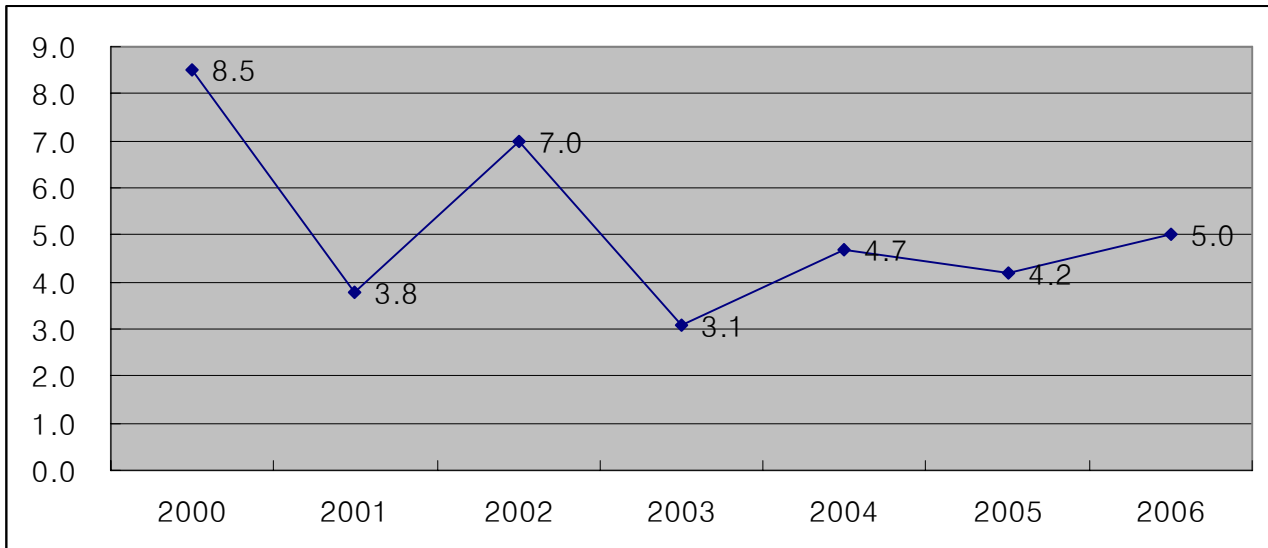


Figure 1.1.2a-2> Gross Domestic Product ; Average increase rate

B. Exports and Imports

The global synchronization of Korea's economy, particularly in concert with economic uncertainty in Japan and the U.S., was reflected in the latest statistics. Total exports for the year 2002 were valued at USD 162.5 billion, which is a jump of 8.0% from 2001. Unlike private consumption and facility investment, which showed negative growth, exports performed robustly in 2003, with annual growth of 19.3%. In 2004, exports totaled 253.8 billion dollars, accelerating to 31.0 percent growth. Exports in 2005 decelerated to 12.0 % growth, however, it continued double-digit growth.

In 2006, exports increased by 14.4% to total 325.5 billion dollars, posting a double-digit increase rate for the five consecutive years. This was largely attributable to the expansion of overseas demand brought about by the sustained rapid growth of the global economy and noticeable improvements in the quality competitiveness of main export items. By item, wireless communication equipment shifted to a decrease in exports and computers, home electronic appliances and textile saw sluggish export performance throughout the year, but machinery, precision equipment, petroleum goods, ships, semiconductors, steel and metals enjoyed high rates of export growth. Exports of chemical products and passenger cars saw a steady increase.

Consumer goods imports rose in 2003, but capital goods and raw materials imports suffered much greater declines in the same year. Imports were valued at USD 178.8 billion in 2003, which was a 17.6% increase from the previous year. In 2004, imports increased by 25.5 % to register 224.5 billion dollars. Imports increased by 16.4 % to total 261.2 billion dollars in 2005.

In 2006, imports accelerated their pace of growth rate from the previous year's 16.4% to 18.4 %, registering 309.4 billion dollars and standing at increasing faster than export for the second consecutive year. By item, imports of raw materials centering on crude oil increased sharply owing to a surge in their prices. Meanwhile, those of consumer goods (excluding gold) showed a speedier pace of increase than the previous year. Imports of capital goods, led by machinery and transportation equipment, increased steadily.

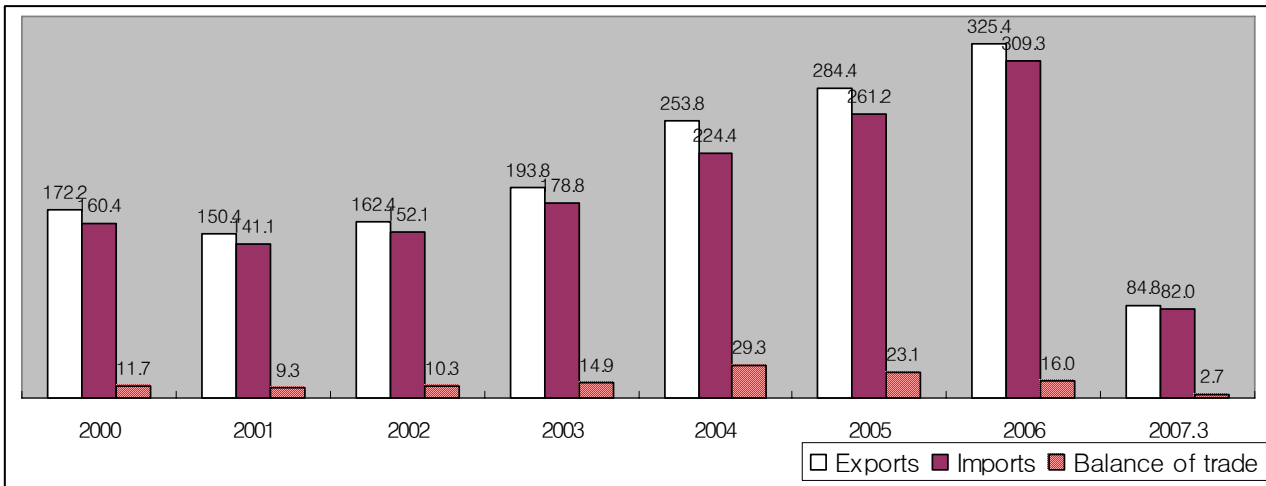
During the first quarter, both exports and imports continued their robust growth. Exports expanded by 14.6% year on year to stand at 84.7 billion dollars, and imports increased by 13.3 % to register 82.2 billion dollars.

<Table 1.1.2b> Exports and Imports

(unit : USD bil., %)

	2000	2001	2002	2003	2004	2005	2006	2007. 3
Exports	172.2	150.4	162.4	193.8	253.8	284.4	325.4	84.8
Annual average increase rate	19.9	-12.7	8.0	19.3	31.0	12.0	14.4	14.8
Imports	160.4	141.1	152.1	178.8	224.4	261.2	309.3	82.0
Annual average increase rate	34.0	-12.1	7.8	17.6	25.5	16.4	18.4	13.1
Balance of trade	11.7	9.3	10.3	14.9	29.3	23.1	16.0	2.7

Resource : FINANCIAL STATISTICS BULLETIN, 2007 , MINISTRY OF FINANCE & ECONOMY



<Figure 1.1.2b> Exports and Imports

C. Inflation Rate

Consumer prices (CPI basis) showed a relatively rapid rising trend during 2001 to stand at 4.1% (on an annual average basis). In 2002, however, their upward pace slowed and consumer price inflation registered 2.7% (on an annual average basis), despite the rising trend of wages and rises in housing prices. The improved price stability was largely attributable to the appreciation of the Korean won and reductions in charges for some public services. The rates of increase in the CPI in 2003 and in 2004 accelerated from the previous years by 3.6% each year due to a hike in the international oil price, a rise in public utility charges, and the persistently high rate of increase in wages.

Despite a surge in international oil prices, the pace of increase in consumer prices in 2005 slowed to an annual level average of 2.7%, affected by the stable prices of agricultural, livestock and marine products and the appreciation of the Korean won against the U.S. dollar.

The consumer price index in 2006 rose by 2.2 % on average, slowing down from the previous year's 2.8%. This was attributable to the continuation of the Korean won's appreciation against the U.S. dollar, the stable movement in the prices of agricultural, livestock and marine products and wages, which together offset the effects of the hike in the prices of international oil and other raw materials.

Consumer prices in the first quarter of 2007 marked an increase of 1.5% from the previous quarter owing to a rise in prices of agricultural and petroleum products as well as a hike in private service charges. Its year-on-year rate of increase, however, posted 2.1%, a pace close to that in the previous quarter.

<Table 1.1.2c> Inflation Rate

(unit : %)

	2000	2001	2002	2003	2004	2005	2006	2007.3
Consumer price index ¹⁾	84.9	88.3	90.8	93.9	97.3	100.0	102.2	104.1
Producer price index ²⁾	100.0	99.5	99.2	101.4	107.6	109.9	112.4	113.4

1), 2) base year is 2005(2005=100).



<Figure 1.1.2c> Inflation Rate

D. Unemployment

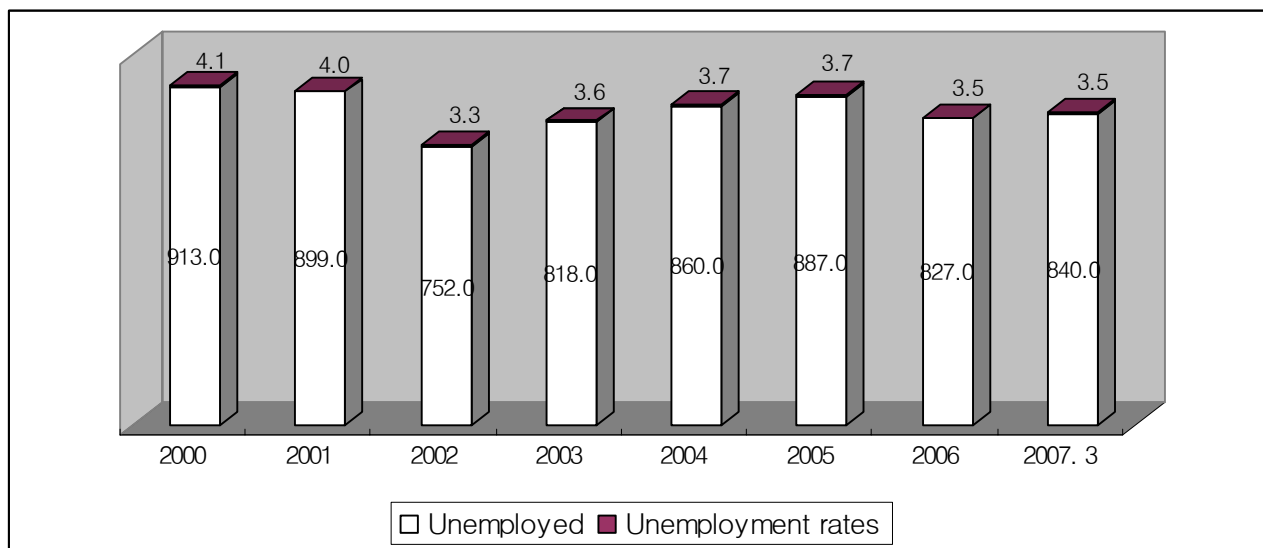
The unemployment rate remained on an underlying downward trend during 2001~2002 as the number of persons employed in the service and construction sectors increased. The annual average unemployment rate declined from the previous year's 4.4% to 4.0% in 2001, and to 3.3% in 2002. However, during 2003, the unemployment rate rose to 3.6%, reflecting the worsened economic situation. In 2004, there was little improvement in labor conditions because of the lackluster state of domestic demand and diffusion of labor saving production method.

The unemployment rate posted 3.7% in 2005. In 2006, there was some improvement in labor market conditions, but this was less than sufficient considering GDP growth. Despite the insufficient improvement in employment, the unemployment rate edged down from the previous year's 3.7% to 3.5% owing to a change in population structure in terms of labor supply. In the first quarter of 2007, the seasonally-adjusted unemployment rate stood at 3.2%, a slight drop from the previous quarter's 3.4%.

<Table 1.1.2d> Unemployment

(unit : thousand persons, %)

	2000	2001	2002	2003	2004	2005	2006	2007. 3
Unemployed	913	899	752	818	860	887	827	840
Unemployment rates	4.1	4.0	3.3	3.6	3.7	3.7	3.5	3.5



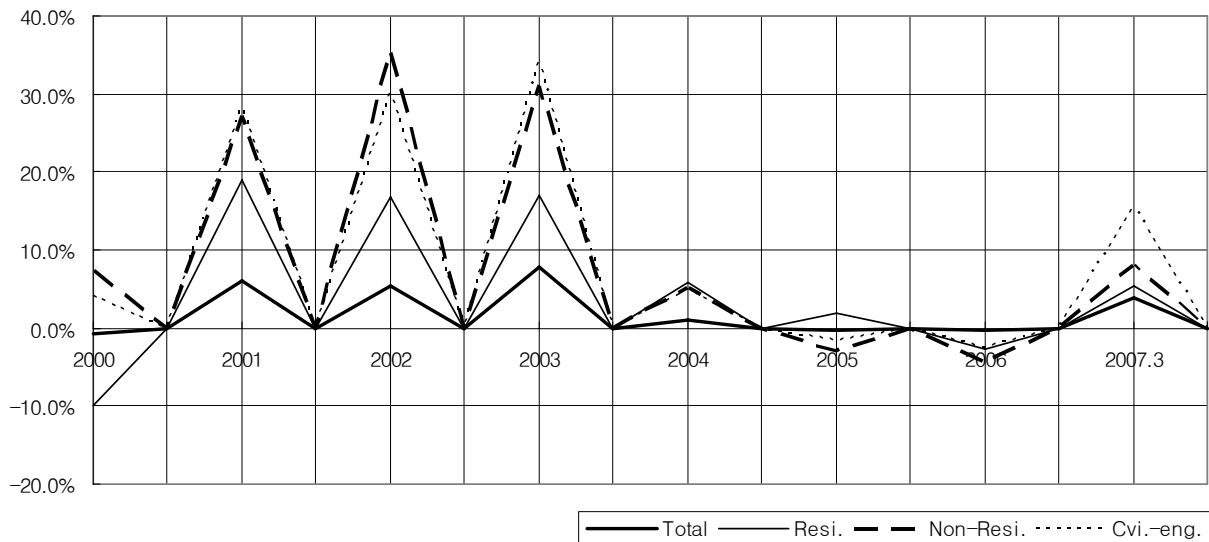
<Figure 1.1.2d> Unemployment

2. Overview of Construction Industry

2.1 Construction Investment and Construction Volume

The construction sector, by its nature, felt deeper impact from the nation's economic situation than any other industry. As evident in the past trend, the construction industry enjoyed healthy growth during the 90s with the increase in housing demand and infrastructure demand.

But activities in all construction industry sectors were more adversely affected by the financial crisis in 1997. There was a marked decline in construction activities caused mainly by deferment of selected new infrastructure projects and the slow implementation of existing infrastructure projects and postponement of non-residential projects.



<Figure 2.1> Construction investment change ratio

From 1999, construction market shows symptom of little recovering due to the recovery action plan implemented by the government and in 2002 it recovered the level of 1997. Construction investment growth rate recorded -0.7% in 2000, 6.0% in 2001, and 5.3% in 2002. The growth rate of the construction industry, contrary to other industries, accelerated sharply recording 7.6% in 2003 owing to brisk private construction amid buoyant housing business and a rise in the government's construction of roads and harbors. Since October in 2003, Korean government has strongly regulated the real estate market to stabilize the housing price in some speculative areas. As a result, the real estate market has been depressed and construction economy has also been adversely affected.

In 2004, the construction business experienced a large fall in its rate of growth compared with the previous year in response to the tightening of regulations on reconstruction, the series of measures to curb real estate speculation and the oversupply of buildings for commercial use, which combined to leave the construction of buildings at a low ebb. After the recession period until 2006, There has appeared a symptom of recovery in the first quarter of 2007 with a growth rate of 3.9% .

<Table 2.1a> shows the sectoral trends of construction investments. According to this, the growth rate of the residential building investments has improved from -9.3% for 2000 to 12.9% for 2001, 11.4% for 2002, and 9.0% for 2003. However, the growth rate of the residential building m^2 investment has shrunk from 4.7% in 2004 to -2.4% in 2006.

Nonresidential building construction investment has continuously increased during the years 2000~2003. However, the nonresidential building construction investment has declined since 2004. In the first quarter of

2007, a symptom of recovery has appeared with a growth rate of 2.8% in the non-residential building investment.

The construction investment for the civil construction sector, mainly depending on the government expenditures, has not shown the persistent pattern during the years 2000~2003. But it has increased gradually since 2004. It was recorded to -0.1% in 2004, 1.5% in 2005, 1.9% in 2006, and 7.4% growth rate in the first quarter of 2007. The government continues to encourage private participation into public infrastructure. As a result of construction investment, the construction volume was recorded to 133,271 thousand m² in 2006.

<Table 2.1a> Construction Investment

(unit: billion won at 2000 year fixed price)

		Total	Residential	Nonresidential	Civil(SOC)
2000	Actual value	96,676.2	24,983.0	23,616.6	48,076.7
	(change ratio(%))	-0.7%	-9.3%	17.3%	-3.3%
2001	Actual value	102,437.6	28,209.9	25,554.6	48,673.1
	(change ratio(%))	6.0%	12.9%	8.2%	1.2%
2002	Actual value	107,882.8	31,431.1	30,363.2	46,088.5
	(change ratio(%))	5.3%	11.4%	18.8%	-5.3%
2003	Actual value	116,427.8	34,269.3	34,667.2	47,491.4
	(change ratio(%))	7.9%	9.0%	14.2%	3.0%
2004	Actual value	117,792.2	35,881.6	34,425.4	47,422.3
	(change ratio(%))	1.1%	4.7%	-0.7%	-0.1%
2005	Actual value	117,464.1	36,664.4	32,689.3	48,110.3
	(change ratio(%))	-0.2%	2.2%	-5.0%	1.5%
2006	Actual value	117,005.2	35,782.7	32,175.0	49,047.5
	(change ratio(%))	-0.4%	-2.4%	-1.6%	1.9%
2007.3	Actual value	22,317.9	7,550.0	6,914.5	7,853.5
	(change ratio(%))	3.9%	1.4%	2.8%	7.4%

Source: Bank of Korea, National Accounts.

<Table 2.1b> Construction Volume (Gross Built-up Area; Thousand Square Meters)

Type of Development	2000	2001	2002	2003	2004	2005	2006	2007.3
Gross Built-up Area (Thousand Square Meters)								
Total	81,058	97,717	138,734	142,108	117,461	111,506	133,271	26,074
Residential	41,283	47,856	57,320	62,128	50,099	50,281	53,861	8,167
Commercial	18,882	25,888	49,862	45,809	30,966	23,368	32,570	8,341
Industrial	11,646	13,538	15,366	14,738	14,740	13,579	16,813	3,783

Educational	5,126	5,534	7,604	7,919	8,860	9,862	11,340	2,824
Others	4,121	4,901	8,549	11,513	12,796	14,419	18,687	2,958

2.2 Construction Companies

As the government grip on the industry loosened from 1989, license began to be issued to eligible contractors, first in regular intervals and then now whenever upon request. Therefore, during the last decade the number of general contractors increased by more than sixteen fold numbering up to 12,914 firms in 2006, and likewise, specialty contractors increased almost 6 times to around 37,675 firms. As time goes on, inevitable competition inside the industry intensified. Average annual contractor amount of construction company was 8,300 million won (about 9 million dollars) in 2006.

<Table 2.2> Statistics of Construction Company

Classification \ Year	2000	2001	2002	2003	2004	2005	2006	2007.3
Number of general contractor	7,978	11,961	12,643	12,996	12,988	13,450	12,914	12,871
Average contractor amount (100million won)	75.0	57.0	65.0	78.8	72.7	73.8	83.0	18.8

2.3 Employees and Construction Labor

In 1970 construction industry employed 280,000 workers, that is, 2.9% of total employment. The number of workers increased steadily in the industry. For the year of 2002, more than 1.7 million employees were working in the construction field, 7.4% of total employment. Currently more than 1.8 million employees are in the construction industry. If we compare the share of employment ratio of construction industry with its share of value added in GDP, we can safely conclude that the industry productivity consistently improved as well.

<Table 2.3> Number of Employee in Construction

Classification \ Year	2000	2001	2002	2003	2004	2005	2006	2007.3
Number of employee in construction (thousand person)	1,582	1,585	1,746	1,816	1,820	1,814	1,835	1,850

Resource: Korea construction association.

2.4 Productivity

2.4.1 Value-added per Employee

Value added product per employee in construction industry is decreased by 6.7% in 2002 compared with 2001. This rate is disappointing, since other industries show positive growth rates such as 8.3% in manufacturing and 3.7% in services in the same year. Value added product per employee is increased by 3.9% in 2003 and 1.7% in 2004. But it is decreased again by 3% in 2005.

<Table 2.4.1a> Value-added per Employee

Unit : million won per person at 2000 price

	2000	2001	2002	2003	2004	2005	2006	2007
Construction	27.17	28.57	26.65	27.7	28.17	4.56		
%change	-9.85	5.15	-6.72	3.94	1.7	-3.0		
Manufacturing	35.23	36.21	39.2	41.42	46.14	11.06		
%change	9.72	2.78	8.26	5.66	11.4	5.3		
Services	21.47	21.62	22.42	22.73	22.91	10.02		
%change	1.61	0.7	3.7	1.38	0.8	2.5		
Primary sector	11.97	12.62	12.6	12.51	13.43	1.62		
%change	-19.56	5.43	-0.16	-0.71	7.4	2.6		

* NB: Primary sector includes agriculture, mining etc.

2.4.2 Physical Measurement of Construction Productivity

Physical measurement of construction productivity records 62,128 m² of residential construction, 30,966 m² of commercial construction, 14,740 m² of industrial construction in 2004. In 2005, 50,281 m² and 23,368 m² are recorded in residential construction and commercial construction respectively. In 2006, the measurement records 53,861 m² of residential construction, 32,570 m² of commercial construction, 16,813 m² of industrial construction.

<Table 2.4.2> Physical Measurement of Construction Productivity

	2000	2001	2002	2003	2004	2005	2006	2007.3
Residential	41,283	47,856	57,320	62,128	50,099	50,281	53,861	8,167
Commercial	18,885	25,888	49,862	45,809	30,966	23,368	32,570	8,341
Industrial	11,645	13,538	15,366	14,738	14,740	13,579	16,813	3,783
Others	9,247	10,435	16,186	19,433	12,796	14,419	18,687	2,958
Total	81,059	97,717	138,734	142,108	117,461	111,506	133,271	26,074

* Area (m²) refers to total built-up area.

2.5 Construction Cost

2.5.1 Average construction Material Prices

During the early 1990s, we experienced a severe shortage in construction materials because of the overheated construction business cycle. The construction sector was fingered as the culprit for inflation and trade deficit. Since then the production capacity was increased and also the construction boom cooled down. The demand and supply of construction materials more or less can be matched domestically. However, seasonal shortage has existed, especially in the spring season during which ordering of projects intensified. The official prices of major construction materials are influenced by government guideline but actual transaction value changes according to the market conditions.

<Table 2.5.1> Average Construction Material Price

	Cement in bulk (won per 40kg)	Steel bars (won per ton)	20mm aggregates (won per m ³)	Concreting sand (won per m ³)	Common Bricks (won per thousand pieces)	RMC* kg/cm ³ (won per m ³)
1998	2,415	316,100	10,000	10,458	49,000	46,555
1999	2,600	297,916	10,000	9,333	43,000	45,532
2000	2,728	301,666	10,000	9,000	42,000	45,560
2001	3,000	313,333	10,916	9,125	43,000	47,768
2002	3,225	336,250	11,958	10,167	45,020	50,200
2003	3,333	382,750	12,000	11,000	48,000	55,543
2004	3,404	515,917	13,000	12,250	46,000	53,827
2005	3,387	498,583	13,083	14,167	46,000	51,708
2006	3,370	455,667	13,250	11,333	45,000	49,080
2007.3	3,370	493,000	13,000	11,000	45,000	49,080

* RMC : Ready Mix Concrete

2.5.2 Construction Industry Salaries and Wages

For chief workers, the salary and wage has mildly increased since 2000. But special daily workers and normal daily workers experienced negative wage growth due to decreased construction demand during the years 2003~2004. At present (March in 2007), the average wage per day for chief workers is 80,125 won (about 85 dollars), 74,230 won (about 79 dollars) for special daily wage, and 57,820 won (about 61 dollars) for normal daily wage.

<Table 2.5.2> Construction Industry Salaries and Wages

	2000	2001	2002	2003	2004.	2005	2006	2007
Chief worker	56,598.5	61,280.5	67.007.0	69.514.0	69,773.0	70,235.0	75,504.0	80,125.0
Special daily wage	51,861.0	54,379.0	64.318.0	67.141.0	66,051.0	66,422.0	70,264.0	74,230.0
Normal daily wage	37,267.5	39,927.0	47.857.0	52.483.0	52,374.0	52,585.0	55,252.0	57,820.0

2.5.3 Average Sector Wages

Average wages increased in both construction and manufacturing sector since 2001. At present (March in 2007), the average monthly wage in construction sector is 2,715,511 won (about 2,888 dollars). It is higher than any other industries (2,471,807 won in manufacturing sector, 2,512,840 won in services sector, and 2,387,854 won in primary sector).

<Table 2.5.3> Average Wages per Month by Sector (won at 2000 constant price)

	2000	2001	2002	2003	2004	2005	2006	2007.3
Construction	1,839,844	1,834.683	2,062.514	2,286,627	2,351,713	2,366,343	2,576,544	2,715,511
Manufacturing	1,601,468	1,702,350	1,907.117	2,073,992	2,279,724	2,383,986	2,594,830	2,471,807
Services	1,860,788	1,893,929	1,862.303	2,114,873	2,300,792	2,832,466	2,541,175	2,512,840
Primary sector	1,702,280	1,779,553	1,907.641	2,304,099	2,457,373	2,439,161	2,615,614	2,387,854

2.6 Import and Export of Construction Services

2.6.1 Annual Import/Export of Construction Services

Total exports in construction was 16,468.1 million dollars in 2006. Among them, industrial construction exports occupied the largest portion recording 10,920.2 million dollars. Residential construction exports was 1,256.2 million dollars, commercial construction exports was 2,176.6 million dollars, and infrastructure construction exports was 1,532.1 million dollars. No construction import has been recorded yet.

<Table 2.6.1> Annual Exports of Construction Services

Type of Development	2000	2001	2002	2003	2004	2005	2006
(Value of construction exports by local firms, \$ million)							
Total exports	5,433.1	4,354.9	6,125.9	3,667.7	7,498.3	10,859.2	16,468.1
Residential	731.5	721.3	604.6	531.7	873.6	852.8	1,256.2
Commercial	2,768.1	867.4	538.9	401.7	806.1	373.3	2,176.6
Industrial	1,703.4	2,661.7	4,826.4	2,491.4	5,181.9	8,262.8	10,920.2
Infrastructure	220.2	102.5	136.5	199.6	547.3	835.6	1,532.1
Others	9.7	1.8	19.5	43.1	89.3	534.7	583.0

2.6.2 Top Five Countries for Construction Export and Import(2006)

In 2006, Saudi Arabia is the most important country in construction exports where 3,624 million dollars of construction service was exported. Kuwait (1,982 dollars), Qatar (1,314 dollars), Oman (1,267 dollars), and Vietnam (1,153 dollars) followed Saudi Arabia.

<Table 2.6.2> Top Five Countries for Construction Export

Export	Country	Value (mil \$)	Import	Country	Value (\$)
1	Saudi Arabia	3,623.6	1		
2	Kuwait	1,982.1	2		
3	Qatar	1,314.3	3		
4	Oman	1,266.9	4		
5	Vietnam	1,153.1	5		

PART II

Construction Innovation in Korea

1. Backgrounds

The construction economy is generally considered to be affected by national macro economic conditions, and explained with business cycle. In Korea, however, there is an argument that recent slackness of the construction economy is mainly due to the limitations of construction demand rather than depression of business cycle.

The approaches to cope with the situation are in two ways. One is to adjust the supply structure of the industry to changes in demand size or demand structure. The other is to create construction demand for drastic socio-economic changes.

Because the construction industry has been accustomed to regulations and depended upon government policies for a long time, restructuring the supply system of the industry is significantly disputable, and may produce some negative side effects in the short term. Thus, it is difficult to execute restructuring without decisive policy methods and reformative institutional frameworks.

The sphere and role of construction should be reconsidered with this changing environment. A new market and opportunities will be opened adjusting to the changing environment. Creating construction demand is possible based on the technological progress. Because the technology is applied to the unprecedented demand, epoch-making technology is required.

Because the environment surrounding us is changing so fast and a significantly high degree of change is required for the construction industry, the speed and pattern of the change should also be changed. What the construction industry needs under this situation is 'innovation'. In this study, construction innovation is discussed in two ways: one is innovation at the government level, the other is innovation at the private level.

2. Government Level Innovation

Three types of efforts of the Korean government to innovate the construction industry are introduced in this chapter. First, regulatory reform is evaluated as a policy innovation. Second, investment in R&D is also discussed in the context of technological innovation. Lastly, informationizing construction administration is regarded as an important methodological change to regulate the industry.

2.1 Regulatory Reform

The regulation on the construction industry has been justified, because the industry is closely related to public life and imperfect competition may rise due to its complex industrial organization. However, sometimes, the regulation to correct imperfect competition hinders rather than promotes the market competition and causes inefficiencies of the supply system of the industry.

The most representative example was the limitation on the business scope. The nation is presently enforcing a registration system for contractors in the construction business. Each business is classified into one of two categories, "General" and "Specialty" construction business. The "General Contractor" is classified into 5 types of works such as civil engineering, building, civil engineering and building, industrial facilities and landscaping. And the "Specialty Contractor" is classified into 29 types of different trades such as interior design, earthworks, boring & grouting, etc.

A general constructor who is allowed to carry out a comprehensive contract for construction work should not carry out a specific type of construction work which is allowed to a specialty constructor usually under subcontract with the general contractor.

Under the regulation limiting the business scope, even small construction works which may be carried out by the general contractor only should be carried out by both general and specialty contractors to increase costs and inefficiencies. The regulation also limits the discretion authority of the construction works ordering organization. In addition, the regulation has become null because contractors on both sides participate in the other market through various tactful ways to establish many paper companies.

Recognizing the problems of the limiting regulation on business scope, the government amended the Framework Act on the Construction Industry in May, 2007 and is preparing the subordinate ordinances. Through amendment of the Act, the limitation will be abolished. The complementary measures to follow the amendment and relax the shocks of the policy to small and medium companies also will be provided. That is, the evaluation system for construction capability, the specified classification system for the construction business, and the registration criteria for the construction business will be rearranged so that both the general constructors and specialty constructors may participate in construction projects over a certain volume.

2.2 Investment in New Construction Technology

Recognizing that the national competitiveness of the technology in construction and transportation was lower than the global standard, the Korean government established the goal of construction and transportation in the future as ‘Value Creator’ from the role of simple ‘Growth Supporter’. Specified objectives are; accomplishing the construction technological standards with a ranking within the 7th in the world before 2015, reducing construction costs by 10%, reducing the costs related to transportation and disaster, occupying 10% share of the foreign construction market, reducing traffic accidents by 10%, and inventing 5 best technologies in the world.

To accomplish the goals, the government has continuously expanded the budget for research and development in construction and transportation. Reflecting the social and economic demands in the future, 10 projects were chosen as value creators. They are U-Eco City, Ultra High Rise Complex Functioning Building System, Cubic Urban Renovation System, Intelligent National Land Information Technological Innovation, Safe Sustainable Smart Highway System, Ultra Long Bridge, Future Type High Speed Railway System, Urban Magnetic lev System, Desalting System of Sea Water, and Small Air Plane Technology.

As shown in <table 1>, the government has continuously increased the ratio of the budget for research and development to the total government budget. During the period, 2006~2015, the government will invest 6.5 trillion won (7.1 billion won) in research and development for the technologies for construction, high technological city development, future type railway system, et cetera, as in table 2.

<table 2.2> R&D Investment compared with the total MOCT Budget

Classification	2002	2003	2004	2005	2006	2007
MOCT budget (a)	15,244	17,228	16,327	18,090	17,389	*16,674
R&D budget (b)	46	69	75	152	262	328
B / a	0.30	0.40	0.46	0.84	1.51	1.97

* : not determined (billion won, %)

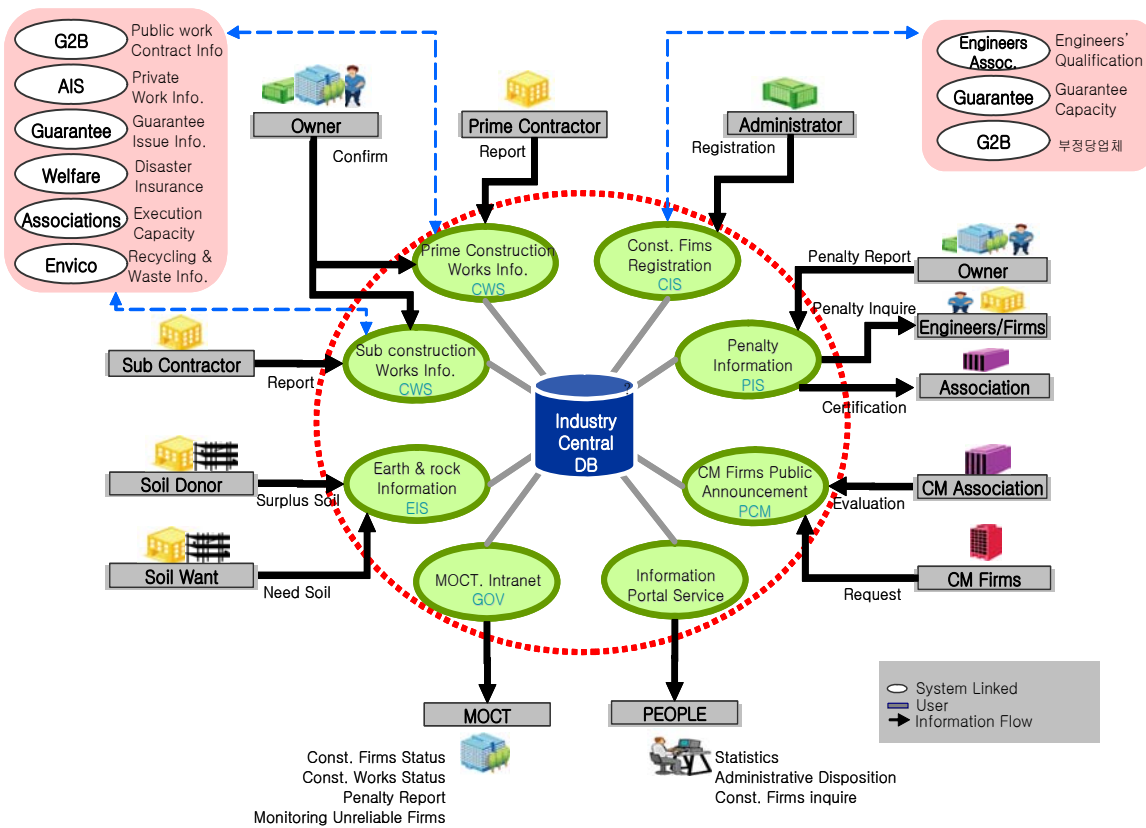
<table 2.3> Estimated investment in R&D during 2006~2015 (trillion won)

Project for construction technology innovation	1.0	Developing future type railway system	2.2
Upgrading plant technology	0.39	Advancement for the logistics system by aviation and ground transportation	0.67
Development project for high technological cities	1.48	Supporting man power for technological infrastructure	0.24
Project for transportation system efficiency	0.7		

The investment of 6.5 trillion won in R&D for 10 years is expected to generate economic effects of 110 ~ 150 trillion won (150 ~ 163 billion dollars) through reduction in direct and indirect costs and development of related industries. In addition to budget increase, the government restructured the project implementation system from the department type system to the big project implementation system. The management method was also changed into the performance oriented project manager system.

2.3 Innovation by Construction Information System

Forecasting the 21st century will be the knowledge and information based society, the Korean government established the information management system that can be total information control on the construction industry. Using this information system, named KISCON, the Ministry of Construction and Transportation (MOCT) can obtain more effective and reasonable governance. The basic strategy of this KISCON is obtaining the industry information at a low cost while making the administration for the industry transparent. Based on the 'Framework Act on the Construction Industry', MOCT has developed their information managing solution of the construction industry under two major directions. One is managing admission to the construction market to be a construction firm. The other is managing the activities in the construction market of construction firms. The system for the former is called Construction Industry administration System (CIS), the system for the latter is called Construction Works information System (CWS). To this infrastructure, MOCT has been adding such as Penalty Information System for inadequate construction work (PIS), Public-announcing of Construction management firm (PCM), a monitoring and inquiring system for MOCT (GOV), Earth and rock Information System (EIS), and information portal system of the construction industry for people (KISCON).



Now, MOCT has governance from these systems electronically, which are currently controlling 70,000 construction firms on their admission to the construction market and monitoring their activity in the market, only costing 1 million US dollars a year. The overall economic effect is reaching over 80 million US dollars.

3. Company Level Innovation

3.1. Competition for Excellent Innovation Practices by Construction Companies

Construction innovation may be realized through the efforts from individual companies to change and survive. The Korean Federation of Construction Industry Societies (KFCIS) opened ‘the Competition for Excellent Innovation Practices by Construction Companies’ since 2006. The competition may show the situation and trend of the activities for construction innovation at the private level.

There are four groups of different types of innovation; innovation for co-operation between construction companies, innovation for business administration, technological innovation, and innovation for customer satisfaction. Innovation for co-operation is demanded because the Korean construction industry has been bipolarized between big companies and small companies, contractors and subcontractors, capital area companies and local companies, et cetera. To reduce the costs and improve the efficiencies necessary to survive under the situation of the Korean construction industry, innovation for business administration is required. To meet and create the new demand for the construction industry, technological innovation should be based on. Finally, innovation for customer satisfaction is added because construction ignoring customer’s demands may no longer survive.

Through the two competition events during 2006-2007, 27 cases in 2006 and 29 cases in 2007 were submitted. The submitted cases can be classified as in <table 3>. Among those cases submitted from the large or small construction companies, 12 cases in 2006 and 8 cases in 2007 were chosen as excellent cases. The selected cases are presented in <table 4>, and the best case each year is briefly introduced in the following section.

<table 3.1a> Number of Cases (Companies) of Submission in Competition

classification		total	business administration	technological innovation	co-operation	customer satisfaction
# of cases (companies)	2006	27(17)	4(3)	19(15)	2(2)	2(2)
	2007	29(12)	8(4)	12(8)	5(5)	4(4)

<table 3.1b> Excellent Cases Selected in Competitions in 2006~2007

2006

Classification	Type	Company	Title
Grand Prize	Co-operation	Lotte construction	Establishing co-operation system through innovation of procuring process
Golden Prize	Business administration	Samsung construction	Innovation of high rise construction management using RFID and 4D-CAD
	Co-operation	Hyundai construction	Successful case for accompanied foreign construction project
Silver Prize	Technology	GS construction	A new productivity improvement in the pier coping construction with pre-assembled reinforcement arrangement
	Technology	Saman industry	Technology for ark gate
	Business administration	Posco construction	Reducing construction period through 3 day skeleton cycle per story

Bronze Prize	Customer satisfaction	Daerim industry	Obtaining opinions and ideas from house wives
	Customer satisfaction	Sinkwang fence construction	Development and construction of environment and residents friendly soundproofing tunnel
	Technology	Lotte construction	Practical use for 120Mpa hyper strength concrete
	Technology	Hyundai construction	Developing WJCS (welding joint control system)
Encouraging Prize	Business administration	Daewoo construction	Construction site innovation utilizing IT technologies
	Technology	Korea ABM construction	Manufacturing and installing technologies for complex arch panel

2007

Classification	Type	Company	Title
Grand Prize	Business administration	Samsung construction	Performing the best high rise building technologies through 3 day skeleton cycle per story
Golden Prize	Technology	GS construction	A new productivity improvement in the M.S.S method with pier bracket self moving system
Silver Prize	Co-operation	Dongbu construction	Construction productivity improvement through construction site innovation from the view of a co-operation company
	Customer satisfaction	Samsung construction	Establishing prosumer system for service innovation for apartment residents
	Technology	Posco construction	Practical use of concrete outrigger for high rise construction
Bronze Prize	Technology	Jaehyun construction	Jacket installing technologies for construction on water-using barge boat
	Business administration	Lotte construction	System for efficiency improvement for a large volume of map information and labor management
	Customer satisfaction	Daerim industry	Innovation for customer satisfaction of e-convenient world

3.2. Selected Cases

3.2.1 Establishing a co-operation system through innovation of procuring process : by Lotte Construction corp. (grand prize in 2006)

This case focused on the procuring process which occupies 70~80% of the construction costs. The case is classified as a innovation for co-operation because the procuring process is based on the co-operation system between contractors and sub-contractors.

The company organized the innovation task force team in 2001. Different from the electronic purchasing system of manufacturing companies which is operating for saving costs and time, the company standardized the procuring process operated with the subjective decisions for improving transparency.

In the registration process for co-operating companies, a one-stop electronic procuring system including on-line construction site presentation, electronic bidding, electronic contract, electronic tax calculation sheet issuance was established. In 2005, the whole procuring processes like developing the standard module for electronic certificate were innovated.

As a result of the procuring system innovation, 8 billion won (8.6 million dollars) of construction costs from the Lotte construction company and co-operating companies were saved. 85% of Lotte employees and 90% of co-operating companies showed their satisfaction in the survey for satisfaction with innovation. In addition, the time for each procuring case was saved from 400 minutes before innovation to 180 minutes after innovation.

3.2.2 Performing the best high rise building technologies through 3 day skeleton cycle per story: by Samsung Construction corp. (grand prize in 2007)

This case focused on method of construction from technical experience of high rise building construction. The company has an experience of three highest buildings out of world top five high-rise buildings such as Petronas Twin Tower in Malaysia, TFC 101 Tower in Taiwan, Burj Dubai Tower in UAE.

From these exceptional experiences, the company developed innovative 3day skeleton cycle per story for the SRC structured high rise building. This technical innovation was based on rational zoning, construction management standardization, system form applying, 3story advance fabrication, and early-strength high performance concrete.

Nowadays, major high rise buildings have the SRC (steel reinforced concrete) structure for their skeleton, and generally this structure takes 45% period of the total construction period. So the period reduction in structure construction is essential in overall construction period reduction.

As a result of the technical innovation, the construction period for a 30 story building has reduced by more than 1 month which is top working day in the world while world class average W/D(working day) per story is 4.6W/D

4. Conclusion

In the past five years, innovation has been the subject of discussion so often everywhere in Korean society. Construction innovation has made visible innovative efforts which the current age requires for the construction industry. Because the innovation activities have not been initiated based on technological innovation during the same period, the innovation was demand-led rather than supply-pushed. Although there have been enormous efforts to respond to this demand due to the social change, it is still questionable that those activities involved the discernable change or challenge of the status quo which was mentioned by West and Farr (1991).¹ Most of the efforts titled ‘innovation’ were not much different from what the government or construction company did before. Innovation should be beyond the simple extension of a normal change.

Innovative reform of construction regulations seems to be limited in nature, because the construction industry deals with public goods such as infrastructure, merit goods such as houses, and others which have external economies. Because the construction industry is based on the contract-subcontract relation among companies and is still intensive with labor, the pure market competition would seriously blow small and medium companies, in turn, employment of the industry would be negatively affected. In addition, ‘price’ has been replaced by ‘value’ as a key parameter of a more advanced construction market especially in the bidding system. In these senses, the regulatory reform of the construction industry no longer means the orientation towards market mechanism.

¹ See *Innovation and Creativity at Work: Psychological and Organizational Strategies* by Michael A. West and James L. Farr, John Wiley and Sons Ltd.: New ed. (1991)

Private creativity is the most important factor in technological innovation. The effect of research and development investment, however, will appear on the national economy in the long term, while it requires huge budget. The investment is very risky and not directly responsive to private companies, it is limited for private companies to assume R&D investment.

The construction Information System shows how innovation in information and telecommunication changed construction administration. The system increased efficiency and effectiveness of construction regulations and improved transparency of construction administration.

For innovation to spread to the whole construction industry and be vitalized, innovation should be led by private companies. Although it is not enough to evaluate the innovation at the private company level through the two innovation competitions, it may show some tendencies about innovation of the construction industry. The competitions resulted in several successes in inducing various types of innovation such as co-operation, business administration, technological innovation, and customer satisfaction by both big and small companies. The competitions, however, did not show private energy for innovation, and still innovation seemed to be recognized as a technological matter.

Construction innovation is on going in Korea. No matter what it is correspondent to what 'innovation' originally means, the important thing is if these efforts would actually change the construction industry which is in crisis.