THE CONSTRUCTION SECTOR OF INDONESIA

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1. EXECUTIVE SUMMARY

Economy of Indonesia is growing better since the economic turmoil 10 Years ago. This current year, GDP Per Capita At Current Market Prices is IDR 21,678,470 (2008) and GNP Per Capita At Current Market Prices IDR 20,908,896 (2008). The inflation rate is 11,06% (2008). The construction sector contribution to GDP increase from 8,17% in 2004 to 8,9% in 2007 but decrease to 7,31% in 2008. The next coming years, it is expected to account more than 9%. This expectation is applicable since Indonesia is known as the second largest construction market up to 2010 in Asia after China (ENR Singapore, 1997). The market covers infrastructure and property investment both under government spending and or private investment. For this year, the goverment spending for infrastructure provision accounts for almost 200 Trillion IDR and this year account for 10.150 IDR (2009) in which for public work projects covering road networks, water resources and human settlement get the public funding increase dramatically since additional infrastructure procurement as a stimulus fiscal for responding the global financial crisis impact. It was estimated that the construction market of this country for the period of 2005 – 2009 is about 1,200 Trillion IDR (Bappenas, 2005).

2. MACRO ECONOMY REVIEW & OUTLOOK

2.1 Overview of National Economy

The Indonesian economy is growing significantly since it was hit by Asia economic crisis in 1997. Now it is considered to be in stable state and to growth at 6,06% (2008). It shows that GDP at constant price 2007 achieved IDR 4,954,028.9 lower than 2007 (IDR 3,949,321.4). The growht of GDP without oil and gas in 2008 achieves 6,52%. Most of GDP is used to household comsumption (57,21% (2008), government expenditure (8,13% (2008), gross fix capital formation (23,69% (2008) and export of good and services 49,56% (2008). The main sources of the economic growth are export (4.1%) followed by household consumption (1.9%), gross fixed capital formation (0.7%) and import (2.8%) respectively.

The business trend index in fourth quarter of 2006 was 107.3 showing that business condition in general is better than third quarter of 2006. This business condition is growing better since increased revenue due to increasing production capacity and number of working time. Higher business revenue occurs in the finance sector, property and services. The higher increased workforce occurs in the construction sector. The highest business index is 115.35 occuring in the construction sector. It shows that this sector is the most increased sector compared to other sectors. However, the agriculture sector has decreased its index (95.12%). The business trend index during first quarter of 2007 was expected about 108.79. During 2007, business condition is expecting higher than 2006 and in this year, construction sector will have higher index.

Consumer trend index across greater Jakarta during last quarter of 2006 was 106.96 showing economic condition of consumers are in better condition. Increased value of consumer trend index is due to increasing household income and consumption of main

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commodities. Higher consumption occurs in the housing expenses (energy and water), transportation, and education, while recreation expenditure decreased. It was expected that economic condition of consumers during 2007 is much better than 2006.

2.2 Main Economic Indicators

The Indonesian economy is in a stable shape towards increased growth. The Indonesian gross domestic product for 2004 in constant 2000 real prices was RP. 1511 Trillion which represents a 1.03% increase on the previous year. To January 2005 the gross domestic product grew at an annual rate of 5.13% in Central Bureau of Statistics data (CBS, Economic Indicators, January 2005). During the same period the consumer price index standing at 118.53 in January 2005 grew by only 1.43 points against 0.57 the previous year (2002=100). The interest on 90-day bank deposit bills was 6.65% in October and the 10-year Treasury Bonds returned 8.31%. Rising cost of materials including that for crude oil leading to an increase in inflation from 5.06% in 2003 to 6.4% in 2004 and the cyclical Rupiah devaluation of 20% against the US$ has forced the government to instigate minimization of energy consumption, spending and subsidy provisions nationwide. The unemployment rate however, increased from 15% in 2003 to 16% in 2004. Despite current uncertainties about the international economy and the downturn in balance of payments from US$28.6 Billion in 2003 to 23.5 Billion in 2004, the rate of economic growth is forecast to continue to the end of 2006 at 6.5%, with the domestic economy proving to be relatively resistant to adverse global economic conditions.

The Indonesian economy continued to grow slowly between 1999-2004 after the Asia Economic crisis had affected all sectors in the regions since 1997, but will obviously be affected by what occurs in the global market. Although difficult to predict, the indications for the Indonesian economy are positive for the years after 2004 judging from the information shown in Table 1 This table shows that the Indonesian economy is getting better.

Table 1. Main Economic Indicators

Indicators	2005	2006	2007	2008	2009 (forecast)
Economic Growth (%)	5,7	5.50	6.28	6.06	4.00
Construction Growth (%)	9.90	9.00	10.40	10.50	9.95
Inflation (%)	17.11	6.60	6.59	11.06	6.5-7,5
Foreign Exchange (Rp/US$)	9,830	9,167	9,300	10,895	10,150
CBC-3 Months (%)	12.83	9.75	8.50	8.67	7.36
Oil Price (US$/barrel)	41.00	64.00	94.00	99.40	71,17

Source: Bank Indonesia Finance Department of RI, www.oilprice.net (2009)

According to the latest CBS the real gross domestic product (GDP) expanded by 6,06% (2008), indicating that the economy is picking up, as the corresponding value for the previous year was 6,28% (2007). In the past the Indonesian economy was relatively resilient against minor adverse international economic conditions. The control exercised over the relatively long recovery period since the economic crisis of 1997-2000, through fundamental economic remedies, has provided a good basis for managing the present uncertainties thereby indicating opportunity for gradual expansion and continuing sustained growth in the key sectors of the economy. These include in particular the construction, agriculture, manufacturing and services sectors. In terms of consumption and investment (not in the table), for the first half of 2005 compared to the first half of 2004, retail sales at current prices increased by 16%, new capital expenditures by 27% and new government expenditures were up 10%.

Table 2. Macro Economic Development Indicators

(1,000,000 IDR)

	2004	2005	2006	2007	2008	2009 (forecast)
GDP and Components						
GDP at constan prices 2000 Rp. Billion	1,511,757	1,750,815	1,847,127	1,963,092	2,082,104	2,165,388
GDP at current market price	2,095,409	2,774,281	3,339,217	3,949,321	4,954,029	5,152,190
GDP growth (%)	6.17	5,7	5.50	6.28	6.06	4.00
GDP growth (%) for agriculture, forestry and fishery sector	4.06	2.72	3.36	3.43	4.77	3.57
GDP growth (%) for manufacturing sector	6.19	4.60	4.59	4.67	3.66	4.38
GDP growth (%) for services sector	5.20	5.16	6.16	6.60	6.45	6.09
GDP growth (%) for mining sector	4.61	3.20	1.70	2.02	0.51	1.86
GDP growth (%) for construction sector	7,5	7.54	8.34	8.61	7.31	7.95
GDP growth (%) Financial, Ownership and Business Services	5,7	6.70	5.47	7.99	8.24	7.10
GDP growth (%)Transportation and Communication	13,4	12.76	14.23	14.04	16.69	14.43
GDP growth (%)Trade, Hotel and Restaurant	7,7	8.30	6.42	8.41	7.23	7.59
GDP growth (%)Electricity, Gas and Water Supply	5,4	6.30	5.76	10.33	10.92	8.33
Demographic Indicator						
Population (number)	215,980	219,852	222,747	225,642	227,779	230,633
Population growth rate (%)	1.16	1.79	1.32	1.30	0.95	1.25
Labour force (number)	104,620	106,280	106,390	109,940	111,879	113,852
Labour force growth rate (%)	2.03	1.59	0.10	3.34	1.76	1.76
Unemployment rate	10,251,351	10,854,254	11,104,693	10,547,917	9,427,590	9,258,964
Unemployment growth rate (%)	0.03	5.88	2.31	(5.01)	(10.62)	(1.79)
Inflation rate	6.06	10.40	13.33	6.40	10.31	6.02
Financial Indicator						
Short term interest rate (%)	16.57	16.83	17.58	16.13	16.62	17.12
Long term interest rate (%)	13.41	16.23	15.07	13.00	13.90	14.87
Changes in Consumer Price Index (2007=100)	124.19	141.50	148.34	155.58	170.18	186.16
Average change against USD$	9,290	9,830	9,020	9,300	10,895	10,150

Source: CBS (2009) & Central Bank of Indonesia (2009)

3. OVERVIEW OF THE CONSTRUCTION INDUSTRY

4.1 Construction Investment

The construction value completed can be seen in Tabel 3. The Government of Indonesia has expressed her desire to speed up infrastructure development in order to accellerate economic growth to levels of 7.8% through increasing the ratio of Investment to GDP to 28.4% from 19.6%, opening new job opportunities to reduce unemployment and poverty alleviation to 5.1% and 8.2%. The above investment driven development plan can be seen in Table 4 which depicts infrstructure demand between 2005-2009 to be Rp.145 Trillion or US$15.825 Billion. A more accurate picture can be obtained in Table 5 which illustrates for construction investment and maintenance demand in the Department of Public Works to total Rp.73.59 Trillion; broken into Bina Marga (Roads and Bridges) Rp.21.27 Trillion, Sumber Day Air (Water Resources) Rp.34.53 Trillion, Cipta Karya (Human Settlements) Rp.14.60 Trillion, and Other Public Works Rp.3.18 Trillion.

Table 3. Value of Construction Completed by Type of Construction
2004 – 2009 Based on Contract Price

(1,000,000 IDR)

	TYPE OF CONSTRUCTION	2004	2005	2006	2007	2008	2009*
1	Residential	4,795,995	7,495,904	9,305,172	9,305,172	11,263,484	13,633,931
2	Non residential	18,581,659	20,701,163	22,069,558	23,528,407	29,613,637	37,272,710
3	Electrical installation	3,825,819	3,174,567	3,363,393	3.563,451	3,775,409	3,999,974
4	Gas and Water supply installation	114,635	431,511	371,544	319,911	275,453	237,174
5	Sanitary installation	69,988	206,000	194,926	184,447	296,659	477,137
6	Foundation	353,875	1,155,892	850,095	625,198	1,127,658	2,033,936
7	Sound system, AC, lift, etc	2,038,887	1,090,505	1,268,817	1,476,285	1,261,856	1,078,573
8	Water supply network	447,877	487,919	512,374	538,055	681,455	863,073
9	Oil and Gas pipe network	759,422	650,974	648,546	646,127	1,031,995	1,648,304
10	Electricity network	1,559,105	439,088	1,027,867	2,406,148	3,653,882	5,548,641
11	Road and bridge works	15,083,795	18,844,750	19,897,065	21,008,143	25,345,791	30,579,053
12	Irrigation/drainage	4,975,447	3,845,006	4,553,470	5,392,472	6,999,582	9,085,657
13	Electric power supply and Telecomunication Network	20,973	2,823,137	1,137,230	458,105	218,031	103,770
14	Construction or improvment of airport, harbor, bus station, etc	1,440,669	1,688,968	1,598,572	1,513,014	1,112,716	818,325
15	Other construction works	1,936,391	4,282,534	5,144,678	6,180,386	7,827,060	9,912,468
	TOTAL	56,004,537	67,317,918	71,943,309	79,391,287	94,484,668	117,292,725

Source: CBS (2009)

Table 4. Construction investment plan (2008 – 2009)

MODEL PROJECTS	USD $Million
Central Java Coal Fired Power Plant 2 x 600 MW	1,200
Pasuruan Combined Cycle Power Plant 1 x 500 MW	275
Medan Kuala Namu Tol Road 60 kms	142
Solo Kartosono Tol Road 165 kms	928
Margagiri Ferry Terminal 0.9Million Vehicles, 1.2 Million Passengers	97
Teluk Lamong Seaport (Tanjung Perak Port Expansion)	275
Bandung Water Supply Project	26
Dumai Water Supply Project	44
Tangerang Water Supply Project	37
Palapa Ring Telecommunications Projects 7 ring FO 30000 kms	1,500
Total	4,524

Table 5. Public works investment plan (2008 – 2009) (USD Million)

Public Works	Strategic Plan 2008	Indicative Investment 2008	Strategic Plan 2009	Proposed Investment 2009
Road Networks	8.80	10.02	10.30	11.25
Water Resources	13.20	15.80	15.10	18.73
Human Settlement	5.60	7.13	6.49	7.47
Others	0.88	1.42	0.95	1.77
TOTAL	28.48	34.37	32.84	39.22

4.2 Construction Companies

According to Law No. 18/1999, construction company consists of consulting and contracting company. Consulting company can be designer and also supervison engineer. Under a new guideline for construction services certification and registration, the number of certified consulting companies was 4.389 firms consisting of 3.280 firms (G1-G2), 824 firms (G3) and 285 firms (G4) and registered by National Board of Construction Services Development (NBCSD) in 2008. In the same year, the number of certified contracting companies was 112,071 firms registered by NBCSD 2008. These contracting companies consist of G1 up to G7 qualification firms. The number of small contracting companies (G1-G3) was 101,293 firms (90%). The number of medium contracting companies (G4-G5) was 10,083 firms (9%) and the big contracting company (G6-G7) is only 695 firms (1%). Of the figure, 263 Contractors already hold ISO-9000.

The Number of foreign construction companies has been increasing since a couple of years ago. In this year, the number of foreign contracting companies in Indonesia is 79 firms mostly coming from Japan and it is about 67 consulting companies mostly also coming from Japan. In the period of January to July 2007, 19 foreign contractors and 9 consulting firms were endorsed by the government.

4.3 Construction Employees and Workforce

Total number of registered engineers is about 106,283 professional engineers (2008). The following table 6 shows the distribution of certificate held by professional engineers according to their expertise.

Table 6 The Number of Professional Engineer

ENGINEER	QUALIFICATION				TOTAL
	BEGINNER	LOWER MIDDLE	MIDDLE	HIGHER	
Electrical Engineer	165	5,225	3,869	433	9,692
Landscaping Designer	327	4,423	1,099	213	6,062
Civil Engineer	4,841	58,368	18,182	1,917	83,308
Mechanical Engineer	62	2,282	710	74	3,128
Other	37	253	438	71	799
Architecture	265	1,268	1,497	264	3,294
Total	5,697	71,819	25,795	2,972	106,283

Source: NCSDB (2008). Note: a professional engineer may hold more than one certificate of competence.

The number of workforce working in the construction sector is more than 5 million people in average. The following table 7 shows annual number of construction workers.

Table 7 The number of construction workforce

Year	2004	2005	2006	2007	2008	2009
Construction Labour	4,540,102	4,417,087	4,697,354	5,252,581	5,547,324	5,858,606

Source: CBS (2009)

4.4 Construction Productivity

Productivity in construction varies according to many factors. Current research findings (Wuryanti, 2005) on productivity measurement show different level of productivity in construction works under observation. The following table 8 figures out some findings from productivity analysis of 4 composite columns of reinforce concrete.

Table 8 Some findings of productivity analysis

No	Construction Works	Unit	Man-Minute
01	Steel cutting for reinforce concrete	M^3	21.90
02	Steel fixing for reinforce concrete	M^3	28.50
03	Concreting for sloof foundation	M^3	16.56
04	Formwork dismantling	M^3	4.10
05	Soil stabilisation under floor	M^2	36.10
06	Concrete work	M^3	17.11

Source: Wuryanti (2005)

4.5 Construction Cost

Indonesia is a large country with high diversity. It is very difficult to get a standard figure of construction cost across archipelago. In Jakarta, skill worker may have 100,000 rupiahs daily wage while in other regions such as Yogyakarta only 40,000 rupiahs. It is similar to natural material price such as sand and stone. In Central Java where sand and cobble stone are easier to get, the cost of sand is roughly 70,000 up to 90,000 rupiahs for 1 m^3. It is quite common to buy a truct of sand which is about 2.5 – 3.5 m^3 will cost about 300,000 up to 350,000 rupiahs.

Table 9. Indices of Permanent Workers, Mandays, Wages & Salaries and Value of Construction Sector 2004-2008(Qrt.II)

Year and Quarter (1)	Permanent Workers (2)	Mandays (3)	Wages & Salaries (4)	Value of Construction (5)
2004				
Qrt I	97.77	94.38	94.27	95.36
Qrt II	96.06	92.78	94.5	87.24
Qrt III	100.57	106.77	107.03	106.47
Qrt IV	99.29	104.66	102	104.08
2005				
Qrt I	104.75	107.72	108.52	110.85
Qrt II	110.21	109.19	111.53	115.23
Qrt III	102.77	108.71	109.54	114.01
Qrt IV	100.38	110.48	110.46	111.27
2006				
Qrt I	108.27	107.83	110.82	110.01
Qrt II	108.44	105.31	110.8	110.63
Qrt III	100.58	103.74	103.84	105.97
Qrt IV	100.46	112.14	115.97	113.09
2007				
Qrt I	101.59	98.28	97.54	99.92
Qrt II	100.77	100.07	101.10	101.37
Qrt III	102.13	108.57	111.75	112.51
Qrt IV	102.67	107.62	108.80	109.02
2008				
Qrt I	101.99	110.78	115.02	111.96
Qrt II	103.92	109.71	113.35	113.51

Source: CBS (2009)

Table 10. Construction Material Prices (Feb 2009)

PASIR + Batu		
Sandclayey for Embankment (per m3)	Rp	175.000
Soil for Embankment (per m3)	Rp	130.000
Sand for Bricklayer(per m3)	Rp	145.000
Sand for Masonry (per m3)	Rp	150.000
Sand for Concrete (per m3)	Rp	195.000
White Sand Bangka (per m3)	Rp	175.000
White Sand Rangkas (per m3)	Rp	170.000
Sandy Gravel (per m3)	Rp	110.000
Gravel 1/2 (per m3)	Rp	150.000
Gravel 3/4 (per m3)	Rp	165.000
Fly Ash (per m3)	Rp	145.000
Boulder (per m3)	Rp	135.000
Sand with gravel (per m3)	Rp	135.000
Biscos (per m3)	Rp	135.000
Gravel (per m3)	Rp	210.000
Stone (per m3)	Rp	130.000
Pressed Brick (Unit)	Rp	413
Normal Brick (Unit)	Rp	303
CEMENT		
Cement by Cibinong (kujang) (50 kg)	Rp	46.000
Cement by Tiga Roda (50 kg)	Rp	46.000
White Cement by Tiga Roda (40 kg)	Rp	62.500
Cement Gresik (50 kg)	Rp	43.550
Cement by Holcim	Rp	44.850
CONCRETE STEEL		
Diameter 6mm (12m)	Rp	21.000
Diameter 8mm (12m)	Rp	32.000
Diameter 10mm (12m)	Rp	49.000
Diameter 12mm (12m)	Rp	64.000
Diameter 16mm (12m)	Rp	110.000

Source: www.duniarumah.com, accessed Sept 2009

4.6 Export & Import of Construction Services

The Indonesian construction has been working overseas since 1980s, particularly led by State Owned Contracting Companies such as Waskita Karya, Adhi Karya, Hutama Karya in Asean and Middle East countries. Although, the construction export is not so progressive, it built confindent level among construction companies working overseas. The number of construction companies doing export is still less than foreign companies coming in Indonesia.

Current figure shows that most foreign construction companies in Indonesia come from Japan, followed by US, China and then Europe. The companies come over through loan agreement policy and international competitive bidding particularly in the oil and gas sector, power plant projects and large infrastructure projects under loan or grant agreement.

REFERENCES

1. Central Bank of Indonesia (2009), Annual Report of National Economy, Jakarta
2. Central Berau of Statistic (2007), Economic Indicators 2007, Jakarta, Indonesia, June, 2007
3. Mulyo, SS & Abidin, IS (2007), Construction Market in Indonesia, Japan - Indonesia Seminar II, Department of Public Works, Republic of Indonesia, Jakarta.
4. Public Works Department (2008), Program and Target Development, Jakarta
5. Suraji, A (2007), The Indonesian Construction 2030, National Construction Services Development Board, Jakarta
6. Wuryanti, W (2005) Cost Index Component of Reinforce Concrete & Composite for Building Construction (in Indonesian), Seminar, Institute for Research & Development, Ministry of Public Work, Jakarta.

IMPROVING CONSTRUCTION INDUSTRY PERFORMANCE THROUGH VALUE CHAIN INTEGRATION: CASE OF INDONESIA

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Abstract

The construction industry has a fragmented structure with many small to medium sized firms that ultimately this fragmentation is the industry's cause of poor performance. The response is then to impose normative models for project supply chain integration with the assumption that this will ensure industry development. Indonesia with a population of over 200 million involve over 136.469 registered construction companies, 99% of these are small and medium-sized firms. Construction sector contributes 7-8% of GDP and provide employment for 4-5% population. This strategic sector has initiated several efforts to enhance productivity and efficiency through the integration of value chain. These include the publication of numerous national standards, the increase use of ICT in major construction firms, the publication of FIDIC contract in national language, and the limited practice of construction supply chain management. Future developments should involve the building of national standard production information, the far-reaching use of fair contract, and the revisions of construction legal aspect which will be the foundation of the whole process in integrating the value chain.

1. Integration of the construction industry value chain

The construction industry is characterized by business and process fragmentation because the structure of project organization is complex and has many phases. A construction project team consists of many parties (i.e. owner, designer, and contractor) with different levels of knowledge, disciplines, expertise, resources, and interests. The process is divided into several separate phases, (i.e. feasibility study, design, procurement, construction, and operation and maintenance).

Process integration for the construction industry has been an attractive topic for researchers and practitioners in this industry since integration can benefit all parties involved in a project. Fergusson et al. (1996) defined integration as the flow of knowledge and information in three dimensions: vertically (between industry functions), horizontally (between disciplines or trades), and longitudinally (through time), by organizational ('humanware') and technical (software and hardware) modes. Nam and Tatum (1992) suggested four major means to increase construction integration: contractual (between parties for a relatively short time), organizational (physically in one organizational boundary under common leadership), information (integrated computer technology) and non-contractual (practical integration, such as owner's leadership and long term business relationships between parties). Pudicombe (1995) classified integration as either organizational or technological. To achieve organizational integration, contractual and social/psychological approaches can be used. For technological integration, the use of integrated computer technology or information integration is necessary.

Referring to Pudicombe's classification, one approach used to accommodate organizational integration involves the project delivery chosen for the conduct of the project. The traditional project delivery method, i.e., separate design and construction contracts, fragmented the project phases and the entire construction team. As an

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alternative, other delivery systems can increase the degree of project integration by allowing a constructor to participate in the design process and creating more designer/contractor teamwork such as design-build, turnkey, and build-operate-transfer (Gordon 1994).

For technological integration, the concept of Computer Integrated Construction (CIC) is commonly used. CIC is a computer-based concept related to the integration of project participants into a collaborative team with the utilization of computer applications through all phases of a project (Teicholz and Fischer 1994). The CIC technologies include: object oriented programming (OOP); knowledge based systems (KBS); database management system (DBMS); computer aided drawing/design (CAD) and visual computing; robotics and automated systems; computer aided engineering (CAE); and local area networking. From past experience, the communication technology for information transfer plays an important role in CIC implementation (Miyatake et al. 1992).

Regardless of the approaches used in accommodating integration in construction, communication tools are a must. The greater the level of collaboration and concurrency in a process, the greater the level of coordination required. The need for more coordination means more communication between phases, processes, and project participants. The information transferred in such communication is in various formats and should be able to be used by all parties and transferred in a timely manner. Therefore, Information and Communication Technologies (ICT) is the answer and has great potential for use in all integration aspects in construction.

2. Initiatives and measures to integrate the construction industry value chain

Fragmentation occurs also in Indonesia construction industry. With over 136 thousands registered construction companies, only 5000 firms are considered “big.” These companies are not able to operate at scale and achieve economies and efficiencies, so they cannot afford to do R&D and spend money on technology to improve efficiencies. Efforts to address industry fragmentation need collaboration, which have been initiated by Indonesian major stakeholders.

Standardization of administrative practices and procedures

Integration of the construction industry can be achieved through the use of a national standard production information. Different types of construction information are exchanged between the various parties for the purpose of communicating design, construction and contractual matters. Individual firms have developed their own means of classifying and disseminating construction information to facilitate this process. As there is no standardised system of classifying and sharing of such information, much of the data is lost along the way.

Indonesia has established the National Standardization Body (BSN) in 1997 as a non-departmental government institution with main responsibility to develop and conduct standardization activities, including for construction sector. Their products, namely SNI, are the only standards nationally applicable in Indonesia. In order to have a wide acknowledgement from different stakeholders, an SNI is formulated in accordance with WTO Code of good practice. SNI are classified according to International Classification for Standard (ICS). In 2009 there are 6929 SNIs granted, mostly for materials, engineering, agriculture and food technologies; 634 SNIs are for the construction sector. The implementation of SNIs is voluntary, however it is compulsory to comply with SNIs which are relevant to public safety issues. For the construction sector, the Department of Public Works through its R&D division is the main initiator and facilitator. The SNI for construction sector is relatively numerous, however they cover very limited aspects of construction operations, management, and maintenance. The number of standards developed annually are decreasing, because of the high development costs, therefore in recent years many standards are more of adaptations (translations) from international standards.

Regarding construction contract, in 2008 the MBD (Multilateral Development Banks) Harmonised Edition of the FIDIC General Conditions od Contract was published in Bahasa Indonesia version. This publication has been endorsed by the Construction Services Development Board (LPJKN). Other types of FIDIC contracts are also in the development process to be published in national language. The far-reaching use of standard and fair contracts will contribute to the equality partnerships between the clients and the contractors. The government as the biggest client needs to support such effort.

Increase utilization of ICT in construction industry

The Indonesian contractors, as well as majority of contractors in any country, still struggle with their problems of delivering their products efficiently (Alwi et. al. 2002). It is a well-known phenomenon that the construction industry, as well as the Indonesian construction industry, still faces problem of inefficiencies in their business processes. One of strategies that is believed can answer the challenges is to improve efficiency and effectiveness of business processes by adopting information and communication technologies (ICT). Brochner (1990) stated that ICT adoption will improve coordination, inspection, and communication in an organization. Furthermore, Betts et al. (1991) mentioned that ICT will give a new opportunity as a strategic weapon for gaining competitive advantage, improving productivity and performances, giving new way of managing and organizing, and opening a new business.

In Indonesia, a research conducted by Pamulu et al. (2003) showed that about 55% of large Indonesian contractors have adopted ICT for their business purposes by investing about 1-5% of their annual budget on ICT. Only 32% of them have managed to invest about 6-10% of their annual budgets for ICT. The research also showed some arguments that Indonesian contractors put on why they did not want to invest their money on ICT. It was shown that about 40% of the Indonesian contractors still think that investment on ICT is difficult to prove in term of money they can gain. This is merely because contractors cannot really feel benefits from their investment on ICT. Abduh and Hikmawati (2003) made a premise that the root problem may lay on poor management of ICT by contractors, i.e. in strategic planning, design, implementation, maintenance, evaluation and human resource processes.

Series of studies have been conducted to develop tools for measuring Indonesian contractors' performance in managing ICT (Abduh 2007). The studies produced the critical success factors in managing ICT, the assessment model to measure performance, and a knowledge-based benchmarking system to provide improvement strategies in managing ICT by contractors.

Based on one of the survey's findings (Abduh et.al. 2005), the most critical success factors identified from contractors seemed to follow general practices in any organization, except success factors in planning and implementation phases of ICT management where numbers of identified critical success factors were less and tended to diverge from common practices. The differences are due to the nature of contractors' business processes and environment which enable contractor to utilize ICT merely for supporting activities. This phenomenon could be well described by the strategic grid for ICT model (Cash et. al. 1992) where contractors are belong to the support grid which means that ICT has little relevance to the organization and simply supports existing processes.

More analysis on detail performance of contractors in managing ICT for each phase concluded several weaknesses of Indonesian contractors in managing ICT as follows (Abduh et. al. 2005):

- ICT utilization is not strategically planned and well defined at the beginning of ICT management phases.
- ICT is utilized merely for supporting administrative and operational activities.
- Human resource development plan/career is not well defined for ICT personnel.
- Maintenance of ICT is conditional.

Another survey was conducted to assess the performance of Indonesian large contractor firms in managing their ICT. Data collection was performed by distributing questionnaires to targeted respondents and following up the answered questionnaire by interviews. The response rate was 39.3% and all of the respondents (23 contractors) were from city of Jakarta and consisted of 9 government's contractors, 8 private contractors, and 6 foreign or joint-operation contractors. Qualitative rating method using 'bad', 'fair' and 'good' scales and an additive mathematical multi-criteria approach were used in the assessment model. The qualitative ratings were then transferred to quantitative scales, i.e., 1 = bad, 2 = fair, and 3 = good. Figure 1 shows results of the assessment. The average performance value is 1.878 which is categorized less than 'fair' performance and it is shown also that there is no contractor that has gained value of 3 ('good') on overall performance of managing ICT.

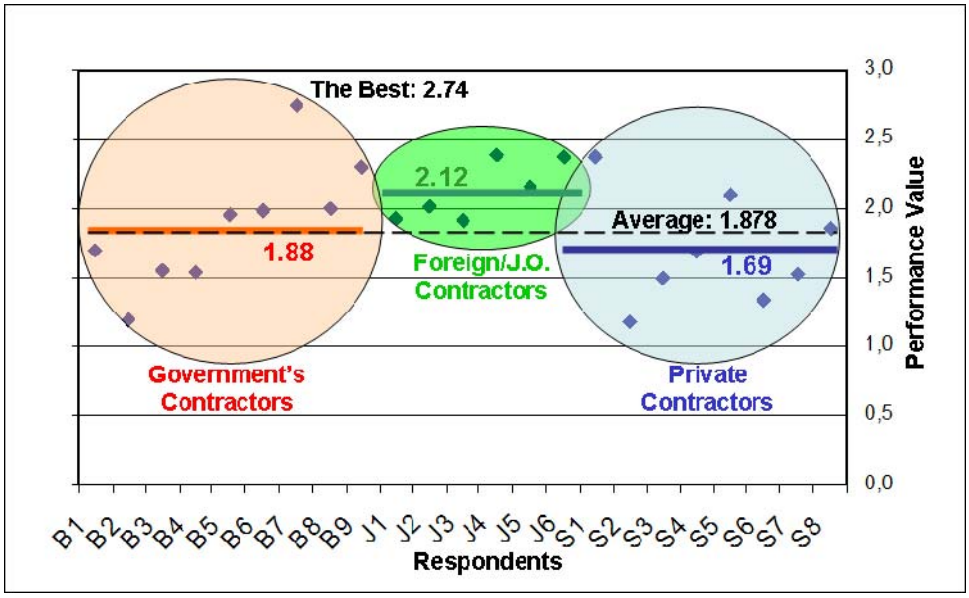

Figure 1. Overall Contractors' Performance in Managing ICT
(Abduh et. al. 2005)

The best performer in managing ICT is a government's contractor that has been doing its business mostly in EPC projects. It seems that type of business a contractor deals with has forced a need of ICT to support the business process. EPC projects are considered more integrated in term of project delivery process if it is compared to a traditional and segmented design-bid-build type of project delivery. With the virtue of this type of organization integration, an EPC contractor is more aware of the need for technological and information integration. Therefore, an EPC contractor tends to put more hope to ICT to answer the integration issues. Eventually, this government's construction firm has a special ICT division with special ICT personnel holding ICT related bachelor degree. The best performer predicate is also given to this contractor since its higher level management is very committed to the adoption of ICT and, even more, the director of ICT division become a champion in the organization to lead ICT adoption.
Besides the detail of studies' results that give better picture of Indonesian contractors' performance in managing ICT, which in average the Indonesian contractors had less than fair performance, the studies also provided general conclusion on characteristics of Indonesian contractors in ICT adoption. It was shown that ICT had not been a factor and had not held a strategic role in Indonesian contractors' business processes. ICT is still considered as an expensive investment with no visible returns. Even though ICT adoption is still ongoing, use of ICT is merely to improve productivity of limited business processes and still cannot contribute to gaining competitive advantages. Yet the

motivation is still there since there is a contractor that had put ICT as critical and significant tools in doing the business. This best-performer contractor would be useful to be a benchmark and also a champion in improving other contractors' preferences towards ICT adoption in Indonesia.

Management of supply chain

The construction industry is specialised and heterogenous with varied structural and behavioural characteristics across individual markets. The greatest difficulty with supply chain management in terms of construction research and practical application is that currently too little is known about these characteristics and how to describe them. Research in the area of construction supply chain, as a means to achieve lean construction in Indonesia, have been recently emerged. Wirahadikusumah and Susilawati (2006) studied several highrise building construction projects in Jakarta and portrayed the construction supply chain patterns, general as well as specific patterns found in those projects. This initial understanding of the characteristics of construction supply chains was then followed by a study on developing their performance indicators (Wirahadikusumah et al. 2008a). These indicators were developed based on the three concepts of lean construction, i.e., "conversion," "flow," and "value." The proposed system can be used as a tool in assessing the efectiveness and the efficiency of the chains.

Wirahadikusumah et al. (2008b) have also used the performance indicators to obtain general portrayal of the construction supply chains on highrise building projects. The study found that in general, Indonesian large construction firms have managed their supply chains but mainly with regard to the concept of "conversion." These firms have maintained long-term relationships with major suppliers and subcontractors. The companies use centralized procurement for main materials and distribute them to projects around the country as needed.

The management practices related to the "flow" and "value" concepts have yet to be implemented. Efforts in managing the "flow" include identifying and minimizing non value-adding activities. Achieving the value as requested by the client is the main goal of the whole production processes. However, in general, contractors have been focused on fulfilling the contract clauses with limited regards for conducting lean production process while at the same time they need to focus more on the client's satisfaction.

Another research by Abduh et al. (2008) was aimed at identifying the cost structure of construction project supply chain and the influencing factors. Research findings are not too compelling in terms of data collected, but it suggests an important issue on the way Indonesian construction companies manage their cost control systems. The cost structure or account for construction projects in general was not yet satisfactorily developed. It appears that the firms do not require classifying the level of detail of its cost structure in view of the fact that there is no necessity to maintain job cost information as well as to adequately control the project. Likewise, cost structure of construction supply chain differs to the manufacturing industry, in which the cost structure of supply chain is very detailed in order to be able to track down all information of expenses, and to manage the activities, as well as to identify opportunities to chop down particular expenses. In general, it seems that the less competitive environment of Indonesian construction industry would be the biggest major factor that caused the findings.

Furthermore, the study also found that the cost of purchasing was very significant in supply chain activity due to merely cost of material purchased. To the contrary, costs of transportation and inventory were trivial. From this finding, it can be concluded that efforts to reduce supply chain cost by reducing costs of inventory and transportation would not be effective. Factors that could influence the cost of supply chain, especially cost of purchasing, therefore are very related to management of supply chain, such as

procurement policy, material requirement planning, supplier qualification, selection process, contract, and supplier development.

3. Future developments

Indonesia construction industry has been struggling with the challenges of fragmentation, the fragile role of LPJKN in development, and the delicate issues in the government's role of promoting/supporting the industry, particularly in the local levels.

Developing national standard production information for construction

As the biggest client, the regulator, and the promotor of the national construction industry, the government (i.e., the Department of Public Works) needs to initiate developing national standard production information for construction. Effective communication of high quality production information between designers and constructors is essential for the satisfactory realisation of construction projects. Such standards of production information for construction works have been widely used in the U.S., the U.K. (and Europe); while neighbouring countries have started to adapt these standards as the recommended national systems. In the era of globalization, Indonesian construction industry needs to catch up in developing such standard in order to be competitive.

Singapore's experience (Goh and Chu 2002) suggests that Indonesia construction industry should not "reinvent the wheel" in developing a new unique standard, it will take too much efforts and at the end the standard will probably cannot be useful in the global competition. Instead, the endeavors should start with a review of international standards (such as the CSI); then followed by a selecting a standard (based on local practitioners familiarity, regional/international compatibility, etc.) for detailed evaluation and should be a subject to considerable scrutiny and discussion among the industry members and academics; and a localization of terminology.

The use of standard contract

Another hopeful development is in the area of contract administration. One of Indonesia's challenges is the low bargaining position of contractors. The wider use of FIDIC contracts has a potential for successful implementation since recent efforst have include publishing these documents in Bahasa Indonesia version. Other standards for plan and design-build, etc. have been contemplated for adaptation. The increase of international financing of infrastructure projects will encourage such effort.

Developing construction national database

LPJKN (the construction services development board) in their website have been maintaining national database for construction industry purposes. The database involve updated lists and statistics of registered contractors, registered consultants, certified professional engineers, certified construction skilled workers, accredited professional associations/organizations, and accredited training centers. The site also contains a limited information on open tenders in all provinces of Indonesia. A "black list" of contractors includes firms sanctioned by LPJK from misdemeanor to severe non-compliance.

Extention of the database may include Indonesian studies on construction issues, particularly pertaining to improving the productivity, efficiency, and quality (performance) as well as practical technologies and management support which are very relevant to the needs of the majority of the stakeholders, i.e., the small and medium-sized companies.

Revising the legal aspects

The Construction Services Law (UUJK 18/1999) was first enacted ten years ago. Its evaluation suggest that the law's objectives have been far from realized. While the law to some extent facilitates the integration of value chain, the impact has not been acknowledged.

The guidelines for public procurement (Keppres 80/2003) have accomodated the use of non traditional project delivery systems. E-procurement has been introduced by LKPP (National Body for Public Procurement Policy) and this body are drafting revision of the 2003 guidelines which is still in confirmation process. The revision is based on the concepts of strategic procurement. The government realize the potential impact of fair public procurement on the improvement of industry performance, including the construction sector. The introduction of innovative procurement by LKPP will force the industry to recognize the requirement of standardization for data exchange purposes.

4. Conclusion

Like many other developing countries, Indonesia construction industry is characterized by business and process fragmentation. Adding to the challenge, only a very small fraction of the industry are considered competitive. Integrating the value chain is a must to improve the industry's performance. While there is a need for concerted efforts, several steps have been initiated by Indonesia stakeholders, and there is an increasing awareness of this issue. Future developments have to be carried out by all stakeholders, led by the government as equal partners, because construction sector plays a strategic role in national development and economy.

5. References

Abduh, M (2007). Indonesian Contractors' Performance in Managing IT: Critical Success Factors, Assessment Model, and Benchmarking System, Proceedings of the 24th CIB W78 Conference, "Bringing ITC knowledge to work", CIB W78 IT in Construction, Maribor, Slovenia, 26-29 June 2007.

Abduh, M. and Hikmawati (2003), Success Factors of IT Management in Indonesian Contractors (in Indonesia). Conference and Exhibition of Association of Indonesian Structural Engineer (HAKI), Jakarta, Indonesia.

Abduh, M., Soemardi, B.W., and Wirahadikusumah, R.D. (2008), Construction Supply Chain Cost Structure, unpublished Research Report, Institute Teknologi Bandung.

Abduh, M., Yasak, N., and Hikmawati (2005). IT Management of Indonesian Large Contractors (in Indonesia). Proceedings Seminar of the 25th Anniversary of Construction Engineering and Management Education in Indonesia. Civil Engineering Departement, Institut Teknologi Bandung, Indonesia, 18-19 Agustus 2005.

Alwi, S., Hampson, K., and Mohamed, S., (2002). "Non Value-Adding Activities: A Comparative Study of Indonesian and Australian Construction Projects." Proceedings of the 10th annual conference of the IGLC, Gramado, Brazil.

Betts, M, Cher, L., Mathur, K. and Ofori, G. (1991), Strategies for the Construction Sector in the Information Technology Era. Construction Management and Economics, 9, 509-528.

Brochner, J. (1990), Impacts of Information Technology on the Structure of Construction. Construction Management and Economics. 8, 205-218.

Cash, J.I., McFarlan, EW., McKenney, J.L., & Applegate, L.M. (1992). Corporate information systems management: Text and cases (3rd ed.). Homewood, IL: Irwin, Inc.

Fergusson, K. J. and Teicholz, P.M. (1996), "Achieving Industrial Facility Quality: Integration is Key", Journal of Management in Engineering, Vol. 12, No. 1, ASCE, 1996, p. 49-56.

Goh, B. H. and Chu, Y. L. (2002). "Developing National Standards for the Classification of Construction Information in Singapore," Proceedings of the International Council for Research and Innovation in Building and Construction - CIB W78 Conference, 12-14 June 2002, Netherland.

Gordon, C.M. (1994), "Choosing Appropriate Construction Contracting Method", Journal of Construction Engineering and Management, Vol. 120, No. 1, ASCE, 1994, p. 196-210

Miyatake, Y. and Kangari, R. (1993), "Experiencing Computer Integrated Construction", Journal of Construction Engineering and Management, Vol. 119, No. 2, ASCE, 1993, p. 307-322

Nam, C. H., and Tatum, C. B. (1992), "Non-contractual Methods of Integration on Construction Projects", Journal of Construction Engineering and Management, Vol. 118, No. 2, ASCE, 1992, p. 385-398
Pamulu, S., Truyen, J., and Bhuta, C., (2003), Strategic Use of Information Technology In Construction Industry : An Indonesia Experience. The Ninth East Asia-Pasific Conference on Structural Engineering and Construction. December 2003, Bali, Indonesia.
Puddicombe, M. S. (1997), "Designers and Contractors: Impediments to Integration", Journal of Construction Engineering and Management, Vol. 123, No. 3, ASCE, 1997, p. 245-252
Teicholz, P. and Fisher, M. (1994), "Strategy for Computer Integrated Construction Technology", Journal of Construction Engineering and Management, Vol. 120, No. 1, ASCE, 1994, p. 117-131
Wirahadikusumah R. and Susilawati (2006) “Pola Suply Chain pada Proyek Konstruksi Bangunan Gedung,” Jurnal Teknik Sipil ITB Vol 13 no.3, Juli 2006
Wirahadikusumah, R., Soemardi, B., Abduh, M., and Noorlaelasari, Y. (2008).” Pengembangan Indikator Kinerja Supply Chain pada Proyek Konstruksi Bangunan Gedung,” Jurnal Teknologi, Fakultas Teknologi Universitas Indonesia, Edisi No.3 Tahun XXII, September 2008.
Wirahadikusumah, R., Soemardi, B., Abduh, M., and Oktaviani, C. (2008). ”Gambaran Kinerja Supply Chain pada Proyek Konstruksi Bangunan Gedung,” Jurnal Teknologi, Fakultas Teknologi Universitas Indonesia, Edisi No.4 Tahun XXII, Desember 2008.