

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 of 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.

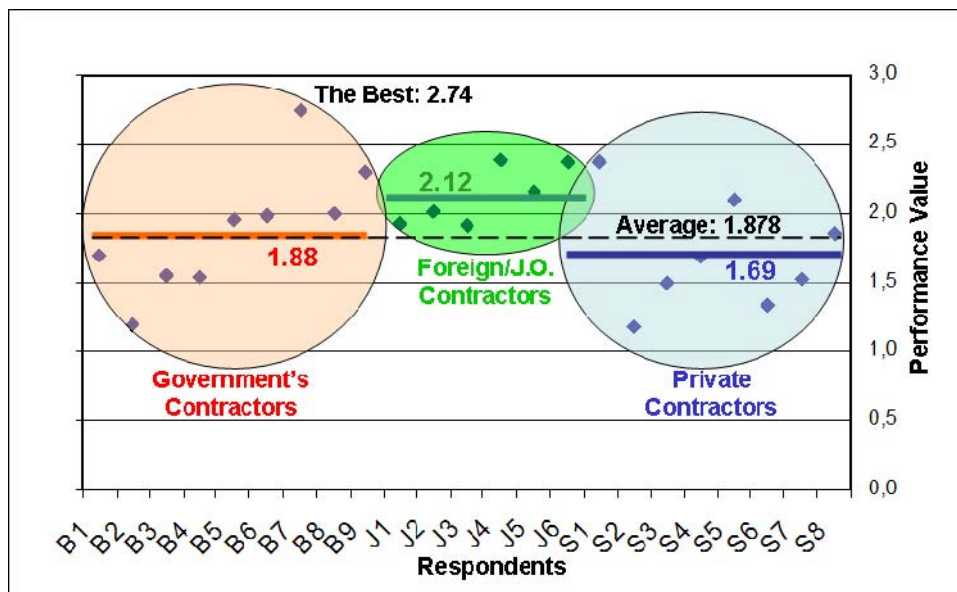


Figure 1. Overall Contractors' Performance in Managing ICT (Abduh et. al. 2005)

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 effectiveness 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 effort 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 accommodated 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.

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