

THEME PAPER: INTEGRATION OF VALUE CHAIN TO ENHANCE THE PRODUCTIVITY AND EFFICIENCY OF THE CONSTRUCTION INDUSTRY

1. EXECUTIVE SUMMARY

It is posited that the productivity of the construction value chain is achieved by positive integration of all construction parties. This paper therefore presents the current situation in Hong Kong. Its objective is threefold. First, several major problems that resulted from the fragmented value chain are identified. It is expected that poor communication, ineffective collaboration and futile construction management are common sources for inefficiency and low productivity of the construction industry. Second, various initiatives and measures that have been taken in Hong Kong to improve the integration of the construction value chain are described. Important initiatives and measures include construction partnering, value management, integrative information systems, economic assurance programs, private sector involvement, etc. Third, future initiatives and measures, such as wider use of partnering, the introduction of contractual partnering and zero defect campaign, have been introduced. Being one of the most important industries in Hong Kong, the construction industry must be able to improve the competency level of their employees and workers in order to maintain its productivity toward sustainable construction.

2. INTEGRATION OF THE CONSTRUCTION VALUE CHAIN

Similar to many other regions, the construction industry in Hong Kong is fragmented and is embedded with an adversarial culture. In such a conflicting and incompatible value chain, how to emulate the productivity, and hence profitability, becomes an important issue. Prior to discussing what initiatives and measures we should take to improve the construction workforce, several major problems are identified and presented below:

1. *Poor communication and inefficient information flow.* Since the construction value chain involves resources transferring among construction parties (Cheng et al., 2001), poor communication and inefficient information flow would result in the “emergence of dysfunctional supply chains” (Love et al., 1999).
2. *Devaluing the construction industry.* Although it is expected that each party of the construction value chain would add value to the construction project, poor collaboration usually leads to poor project performance or even project failure. Such a bad news would spread around the region rapidly, resulting in devaluing the local construction industry.
3. *Impeding environmental sustainable construction.* According to McInnis (2001), the approach currently used by Hong Kong government is a medium by medium system of pollution control, in which a penalty and registry system is established for regulating pollution under “five large categories or media (air, waste, noise, water and land)”. The system has been criticized of being too complicated in consolidating the whole value chain in regulating environmental pollution, which is a key issue in environmental sustainable construction.

3. INITIATIVES AND MEASURES ADOPTED

Since a construction project is performed by various players who should add value to it, integrating them effectively would ensure that the value actually generates for the project. The issues mentioned in the previous section have attracted local attentions where proper initiatives and measures have been provided to improve the operation of the value chain. For example, according to the report jointly written by the then Environment, Transport and Works Bureau (ETWB, 2007) (now re-organized as the Development Bureau) and the Construction Industry Council (CIC), many CIRC (Construction Industry Review Committee) recommendations were put into practice. In addition to those CIRC recommendations mentioned in our theme paper 2008 (e.g., workforce development, prefabrication, automation) (Anson et al., 2008), other major initiatives and measures that have been implemented to improve the integrated value chain are presented hereinafter.

3.1 PARTNERING INITIATIVE

Partnering has long been supported for its effect on strengthening the value chain. The study by Phua (2006) indicates that partnering in Hong Kong is selectively adopted and is “significantly determined by the industry’s level of institutional norms”. Such a driving force from the industry would help to motivate the application of partnering. In Hong Kong, the Government has widely promoted construction partnering. According to ETWB (2007), over 80 partnering workshops have been held to “enhance mutual understanding and communication” at the start of public housing projects. Informal partnering has been adopted in over 30 public works contracts. Local forums for experience sharing have also been held during the past years. On the other hand, contractors have been influenced to take part in non-contractual partnering. For example, Yau Lee Group (YLG, 2009) has been partnering with clients and other players to not only streamline the project construction process but also jointly develop innovative techniques and tools, with an aim to improve work efficiency and reduce cost concurrently. The objective, according to the firm, is to “uplift the quality, health and safety, environmental protection and efficiency to enhance the competitiveness” of the company as well as the whole value chain.

3.2 VALUE MANAGEMENT INITIATIVE

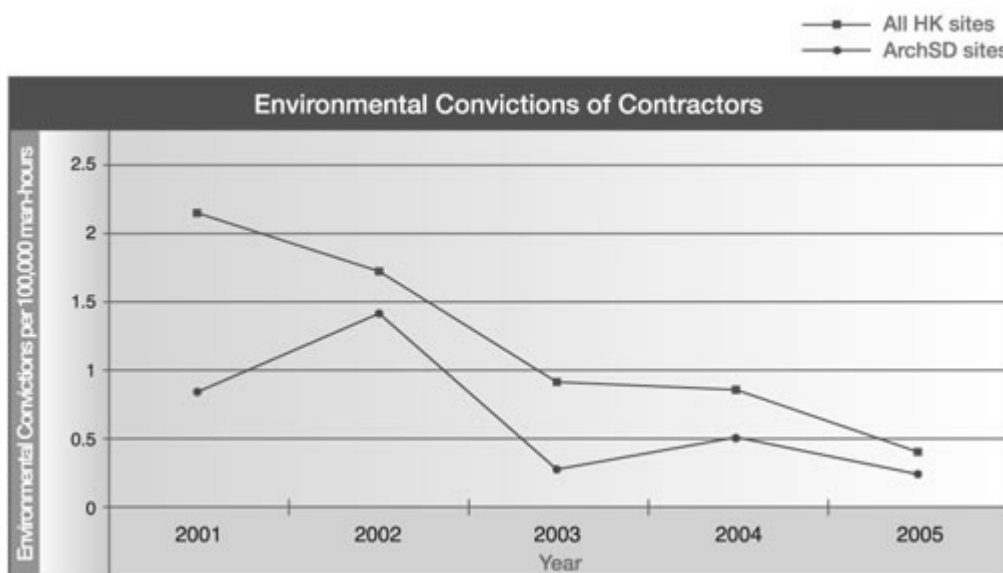
An effective ways to improve value chain management is to “remove non-value added steps and reduce waste cycle time in the process which equates into the bottom line dollar savings”. This inevitably corroborates that value management (VM) is a critical factor of value chain performance. VM, since its introduction into public works projects in 1996, has been “widely used by works departments” in Hong Kong, and its enhanced procedures were promulgated in August 2002 (ETWB, 2007). Future applications of VM and its closely related concept, value engineering, are expected to continue in both private and public sectors.

3.3 GREEN SUPPLY CHAIN MANAGEMENT INITIATIVE

Green supply chain management has been implemented by Hong Kong Government for some years. Both the private and public sectors are active in promoting the concept. According to the Architectural Services Department (ASD, 2005), procurement conditions are comprehensively prescribed by the General Specification for Building (GSB) (2003 Edition). The GSB has a profound impact on the tender outcome since the lowest bid would no longer be the determining factor in a tendering process. The externalities being taken into account,

the emphasis has been placed on designs that might be more expensive initially but can lead to greater potential for sustainable features and reduced environmental pollution costs. The ASD encourages project participants to exploit the opportunities for developing sustainable designs and “vet the blueprints against a list of environmental design features”, including sustainable planning, enhancement of the physical environment, energy conservation, etc.

A productive value chain management should also include monitoring and evaluation of project participants. The ASD reviews their contractors and consultants quarterly once the tender is awarded. Such a review includes assessment on environmental pollution control (air, noise, water, and waste pollution) and compliance with the trip ticket system (a permit for dumping construction and demolition waste in designated landfills). A consultant or contractor whose performance was reviewed as unsatisfactory would be adversely affected with their chances of winning future contracts being diminished. A supplier getting two poor review ratings in a row will be barred from bidding future projects. As shown in the following figure (ASD, 2006), environmental convictions of contractors on ASD’s construction sites are less than the Hong Kong average from years 2002 to 2005. According to the ASD (2006), this is due to their efforts in raising “the environmental standard of the (value) chain in the tendering process” and their “training to raise the contractors’ environmental awareness”.



Source: ASD (2006)

3.4 LEGAL AND ADMINISTRATIVE INITIATIVE

Regulations and standard administration are revised continually to enhance the integration of the construction value chain. According to McInnis (2001), despite the fragmentation within the construction industry, environmental regulation has been considered as promoting value chain integration. The recent Environmental Impact Assessment Ordinance (Cap 499), for example, is described as “a major step forward in integrating environmental controls (for more rational) pollution” handling for environmentally sustainable construction.

Adjudication is another important policy development for the Hong Kong construction industry. Although the application of mediation and arbitration in local construction dispute

resolution are regarded as successful, the use of adjudication has started recently. Hill and Wall (2008) suggested that conflicts between parties can be solved by effective adjudication, especially within the subcontracting community. As they noted, the Hong Kong Government has tried adjudication in a small number of its construction contracts. Yet, its further adoption is not intended although such a feature has been worked in other countries (Hill and Wall, 2008), such as Singapore (Cheng, 2008).

3.5 INTEGRATED SYSTEMS INITIATIVES

Environmental Management System (EMS), which helps to reduce and avoid environmental nuisances arising from the construction works on site, has been promoted by the government and has been implemented by contractors in projects in both the public and private sectors. For example, in order to enhance the environmental performance in delivering its services to the public, the Civil Engineering and Development Department (CEDD, 2006) extended the scope of the EMS to cover all works performed by contractors, who are required to set up an EMS on site to implement and monitor the performance of various environmental mitigation measures. To improve the effectiveness and efficiency of work with contractors further, the Department has combined the Quality Management System (QMS) and the EMS to form an Integrated Management System (IMS) in September 2006, which has successfully fulfilled the requirements of both ISO9001:2000 and ISO 14001:2004, (CEDD, 2007, 2008).

3.6 ECONOMIC ASSURANCE PROGRAMS

A free market has been argued to be the best economic system that is conducive to productivity gains. It drives costs down without scarifying, if not concurrently also raising, quality. However, the positive effect of free market system on productivity gains can be further enhanced with greater collaboration within the construction value chain. For example, the ASD (2008) implemented effective construction cost control and monitoring systems in 2008 to mitigate budget overrun during the construction phase, which “include a web based contract variation management system that enables a real-time access of project financial information by the project team; a dispute resolution advisors system for overall contract administration which can trace possible problematic areas and claims throughout the project period; and a series of professional and independent audits throughout the project period, including audits or checking by the Commissioner of Audit and Independent Commission Against Corruption (ICAC)”.

3.7 SAFETY MANAGEMENT INITIATIVE

Safe construction is also one important issue that would affect the quality of an integrated construction value chain. In Hong Kong, construction safety laws and regulations are governed by two chapters: (1) CAP59 – Factories and Industrial Undertaking Ordinances, and (2) CAP509 – Occupational Safety and Health Ordinances (HKSAR, 2006). Other than the statutory provision, both public and private construction companies have also established their safety policy to improve site safety.

In 2008, the CEDD (2009) organized a significant number of seminars to professional and technical personnel to share their experience in construction safety, landscape design, arboricultural knowledge and sustainable design. Such inter-organizational knowledge sharing strengthens the inter-operational environment of the construction value chain. For example, while contractors are contractually required to provide various forms of safety

training for their workers, the CEDD (2009) has taken heed of the safety training needs of the contractor's site supervisory staff. Apart from in-house departmental training, the Department also organized health and safety training (e.g., ad-hoc safety training seminars and courses) for about 715 attendances (including site staff from contractors) in 2008.

In the private sector, Gammon Construction Limited (GCL, 2009) has their own manual and allows both their internal staff and their subcontractors to be acquainted with the requirements so that the project-wide safety, health, and environmental management system can be complied with. The manual not only follows the British Standards Institute's safety management code, namely OHSAS (Occupational Health and Safety Assessment Series) 18001 and the ISO 14001: 1996 Environmental Management Systems – Specification with Guidance for Use, but also refers to the Code of Practice on Safety Management published by the Labour Department of the Hong Kong Special Administrative Region.

3.8 USER-DRIVEN INTEGRATED VALUE CHAIN

Integration activities can be driven, often very effectively, by end users. For example, Sun Hung Kai Properties Limited (SHKP), one of the largest property developers not only in Hong Kong but also in the globe, has set up value chain integration for improving their products and services to their end users. It makes business sense to promote greenery and energy efficiency in order to offer healthy environments to residents, encourage green living, and promote environmental awareness in children (SHKP, 2009a). In doing so, they claimed to have strived to offer users with stringent quality monitoring in all stages of property development through effective vertical integration that ensures control over all aspects from planning and design to construction, material sourcing, project monitoring and property management (SHKP, 2009b).

3.9 PRIVATE SECTOR INVOLVEMENT ENRICHING CONSTRUCTION VALUE CHAIN

The Hong Kong Government has promoted the private sector involvement (PSI), which aims to enhance public projects' cooperation between the governmental departments and the private sector, for some years. Under the PSI, there are two major types – the Public Private Partnership (PPP) and the outsourcing (Efficiency Unit, 2009). PPPs are contractual arrangements where the public and private sectors both bring their complementary skills and contributions to the value chain. The six forms of the PPP are creating wider markets, joint ventures, partnership investments, franchises, private financing initiatives, and partnership companies (Efficiency Unit, 2009). These alternative procurement methods enrich the flexibility of the value chain structure between public and private sectors.

3.10 INTEGRATION BETWEEN CLIENTS

Other than the integration of different construction players, integration between clients has also been initiated by Hong Kong Government. The Development Bureau (DEVB) was established on 1st of July, 2007 to better coordinate major infrastructure projects commissioned by the nine governmental works departments (namely Architectural Services Department, Buildings Department, Civil Engineering and Development Department, Drainage Services Department, Electrical & Mechanical Services Department, Lands Department, Land Registry, and Water Supplies Department), so that more efficient coordination and resolution of inter-departmental issues could be ensured at an early stage

(DEVB, 2007). It is expected that consolidating the nine departments under the DEVB to deliver their infrastructure projects can maintain the Hong Kong's position as "Asian's world city" and to create jobs for Hong Kong people.

3.11 INFORMATION TECHNOLOGY (IT) IMPLEMENTATION

The adoption of information communication technology can help coordination and collaboration between the projects participants through effective flow of data and communication (Liu et al., 2006). The Hong Kong government has recently adopted the submission of building plans through electronic means. By following the guidelines and fulfilling the requirements, Authorized Persons (APs) can submit building plans electronically (BD, 2008). On the other hand, the manual and time-consuming procurement process is also replaced by the newly adopted E-procurement. Several private companies in Hong Kong have adopted this approach and claimed to have attained great success. It is believed that on one hand, less paperwork is more environmentally friendly, and on the other, lowered transaction costs and fewer repetitious administrative procedures can eventually streamline the procurement process as a whole (Bendoly et al., 2005).

4. FUTURE DEVELOPMENT

The change intervention must start from the senior management of the organizations and must first be carried out internally within the organization. After progress has been made within the organization, change could then be extended to all parties external to the organization within the value chain. The following recommendations pertaining to improving integration of the construction supply chain are extracted from several recent reports including ETWB (2007):

4.1 WIDER ADOPTION OF THE PARTNERING APPROACH

The integration of design and construction, together with the adoption of fabrication and standardization, contribute significantly to productivity because collectively such measures facilitate more efficient communications and hence more effective decision making and cost-effective innovation. Consequently, there is also enhanced interoperability and the project delivery cycle is shortened. The Hong Kong Housing Authority has implemented the "feed-forward partnering approach" to involve project team members in design reviews, while project steering committees were formed to lead and coordinate multidisciplinary public works projects (ETWB, 2007). With the successful application of construction partnering in public projects, it is at the right time to extend its usefulness to the private sector.

By entering into contract with the private sector, the government can reduce the level of subsidy required without lowering the efficiency of the work, as the private sector should have the complete responsibility for the design, build, maintenance, and operation of a service (Efficiency Unit, 2008). It has been advocated that this partnering approach should be more widely adopted so that the overall performance of the Hong Kong construction industry will be further enhanced.

4.2 INTEGRATION OF PARTNERING INTO CONTRACT

Although informal partnering helps to promote collaboration among contractual parties, there is no risk reward sharing in the contract. Contractual partnering (or the so called "contracting

alliancing”) has hence emerged as an alternative procurement method. It is mainly used to select contractors for projects where risk and uncertainty is problematic (Walker et al., 2002). Its principles are similar to those of informal partnering, except that contractual partnering focuses on establishing a formal relationship contract and the parties would be rewarded when they could reduce the total cost of the project.

Given the trial made for the New Engineering Contract (NEC) in the UK and successful applications in Australia, contractual partnering has already drawn the attention of Hong Kong Government. However, more research has to be made to study its usefulness in Hong Kong, especially the extent of the difficulty in its application in the private sector. It is because it promotes the share of risks among contractual parties, which would not be welcomed by most clients who are usually able to transfer their construction risks to the general contractor by their bargaining power, and by making use of contract terms favourable to them. Only those clients (e.g., governmental departments) who are willing to take more social responsibility or look for more productive contractual arrangement would be interested to use contractual partnering. As noted by Thomas Ho (2009), Chief Executive of Gammon Construction Limited, due to the dried-up of private project funding, contractors are difficult to bear financial risks unless positive contract conditions (or partnering-typed contracts) would be offered by the clients.

4.3 THE MATERIAL LINK OF THE SUPPLY CHAIN

No construction work can be carried out without materials. Its supply is therefore a critical issue in the effective and complete integration of the supply chain. Developing a systematic supply chain management (SCM) model then becomes an important factor to enhance productivity. SCM often makes the use of ICT (Information and Communication Technology) to enhance communication, re-engineering of material flow, changing of culture and performance measures identification (Chin et al., 2004). For example, the Yue Yuen Group, a shoes company, implemented such an effective SCM system to help deliver products punctually and meet different clients’ needs (Du, 2007). Though it is an example of the manufacturing sector, it is believed that the same philosophy can be adapted to and adopted by construction firms to uplift the overall supply chain performance and productivity of the construction industry.

4.4 OTHER INITIATIVES

Construction organizations continue to organise inter-organizational training activities for strengthening the construction value chain. In 2008, the CEDD (2009) conducted a comprehensive survey to gauge the safety training needs of site supervisory staff. The survey findings support the provision of training courses in the next two years for target parties including contractors.

Moreover, contractors have focused on other initiatives. For example, in addition to implementing the current “Six-Point Safety Focus” (embodied by “leadership”, “constructability”, “near miss and audit”, “care and engagement”, “belief in our systems” and “role of the safety team”), Gammon Construction Limited has a new initiative on a target of Zero Harm (meaning no death and no injury caused to the public, or to their own people) on or before the end of 2012 (GCL, 2009). According to the company, they will not only put huge effort to train and support their managers and members of their value chain for the new

initiative, but will also elicit stakeholders' views on the safety of construction workers and their support for the new initiative.

Another initiative is the promotion of impartial contractual arrangement in the construction value chain. As Ho (2009) argued, in addition to the fair deal between construction parties, the value chain should be assured of security of payment and the address of any inflationary risks in the contracts. Cheng et al. (2009) also contended that the Hong Kong construction industry should review the issue of security of payment, "considering more for the betterment of the construction industry as a whole and less for one's own immediate or short-term interests". In a similar vein, the use of voluntary adjudication in solving contractual disputes will be encouraged to effectuate the dispute resolution system for the industry.

The wider use of ICT should also be considered. For example, being a "single information communication point", an information hub (IH) enables "data sharing and coordination in supply chain" (Xue et al., 2007). Moreover, layering technique can be harnessed to manage the complex information that is characteristic of drawings and CAD models. In Hong Kong, layer guidelines based on ISO 15667 have been tested. Whilst there is no industry-wide standard yet (Howard et al., 2006), the public sector has implemented a similar standard called CAD Standard for Works Projects (CSWP), as outlined by Tse and Wong (2004). Further efforts and resources should therefore be invested to develop these technologies so as to better facilitate the construction procedures. Recently, there has been some encouraging advancement in the use of Building Information Modelling (BIM) and Virtual Prototyping, which allow on-screen simulation and evaluation of design and construction manoeuvres before they occur on site.

5. CONCLUSION

It is evident from the foregoing discussion that the construction value chain suffers from several major problems that reduce its productivity. In considering this, Hong Kong Government and the local construction industry have put their efforts to implement initiatives and measures for the purpose of better connecting the construction players together. Among others, collaboration-based strategies, such as construction partnering and inter-organisational operations, have been highly promoted. In the future, initiatives and measures would be associated with the quality of the contract (such as the concepts of contractual partnering and impartial contracts) and the inter-organisational activities (such activities as training, resource sharing, campaign and promotion, dispute resolution).

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