

## **THE AGENT-CONSTRUCTION SYSTEM FOR PROCURING MEGA PROJECTS IN CHINA**

### **WEISHENG LU**

The University of Hong Kong  
Pokfulam Road, Hong Kong  
wilsonlu@hku.hk

### **ANITA LIU**

The University of Hong Kong  
Pokfulam Road, Hong Kong  
ammliu@hku.hk

### **HONGDI WANG**

The University of Hong Kong  
Pokfulam Road, Hong Kong  
kevinwhd@hku.hk

### **ZHONGBING WU**

Audit Center for Government Investment Construction Projects  
Shenzhen, China  
wzb82485691@126.com

### **Abstract**

*While heated discussions have been directed towards various innovative procurement systems such as PPP, PFI, and BOT that carry the great expectation to help materialise the projects and deliver value to the society, a procurement system named agent-construction system (ACS or in Chinese Dai Jian Zhi) is being prevailing in China's public procurement. This research aims to examine ACS by relating them to China's particular Political, Economics, Social, Technological, Environmental, and Legal (PESTEL) background. It is found that the ACS is promising in procuring public projects owing to two merits: (a) clearly defined right and responsibilities; and (b) appropriate allocation of resources and risks amongst parties involved. The research is particularly useful when governments worldwide are searching for innovative procurement approaches to help deliver public projects and services. It also sheds light on how to devise an innovative procurement system. A word of caution, nevertheless, is that readers should not follow this "good practice" slavishly. One ought to truly understand the essence of procurement innovation and devise suitable innovative procurement systems in a given PESTEL setting.*

**Keywords:** Procurement innovation, Agent-Construction System, Construction procurement, China

## INTRODUCTION

In the course of procuring public construction projects, no matter whether it is in socialist or capitalist countries, or whether it is in developing or developed worlds, there have been widespread problems discovered. Particularly in China, though its construction industry has made significant development owing to its strong economic growth and unprecedented urbanization plan, several problems have been frequently mentioned, such as cost overrun, late delivery, delay of payment, low efficiency, overstaffed organizations and/or corruption (Yan, Yan, & Yin, 2009; Yin & Yan, 2006; Zhang, 2008). To address these problems, governments worldwide are searching for innovative procurement approaches that can help procure projects in a more efficient way and thus truly deliver values to the society. The often-discussed innovative procurement methods may include, inter alia, Build-Operate-Transfer (BOT) first introduced in Turkey, Private Finance Initiatives (PFI) initially put forward by UK government, and Private-Public-Partnership (PPP) that has been ubiquitously discussed around the world.

It is generally observed that there are two trends in these innovative procurement approaches. Firstly, public procurement is shifting from traditional state-led approaches to partnering between public and private sectors, expecting that the private sector can be more active in improving efficiency and delivering value (Egan, 1998, Winch, 2000). Secondly, integrated approaches were adopted to reduce the problems of fragmentation and discontinuity by which the construction sector has long been plagued (Anderson et al., 2000). Together with the trends is the systems view to construction procurement which emphasizes a procurement system including elements such as contract strategy, culture (e.g. trust and institutions), and finance, should deserve more attention of the construction and project management fraternity (Rowlinson, 1999).

With the success of the procurement systems in some mega projects, they have been introduced to other economies for procuring new projects. However, “one size does not fit all”; a procurement system growing from a certain Political, Economics, Social, Technological, Environmental, and Legal (PESTEL) background may not be of full applicability to other economies with different PESTEL settings. Adopting them slavishly may cause loss or even failure of a project. The big issue is thus to devise innovative procurement systems that are suitable for a given PESTEL setting and should truly deliver value to the society. On the other hand, notably in China, an Agent-Construction System (ACS or in Chinese *Dai Jian Zhi*) is widely adopted in the procurement of public projects, for example, the Beijing 2008 Olympic Games projects. It is intriguing to examine why the ACS became the most widespread procurement approach and what are the implications to procurement innovation that can help procure projects in a more efficient way.

The aim of this research is to shed light on procurement innovation by skeptically examining the ACS and relating it to China’s particular PESTEL background. The rest of this paper is structured into three sections. Firstly, research design and methods are described – this is comprised of extensive literature review and interviews with practitioners. Secondly,

discussions are conducted to deepen the understanding of the ACS in terms of its history, strengths and weaknesses. Of particular importance is to project the procurement systems into China's PESTEL background. Research findings are presented in this section. Finally, key conclusions are drawn together.

## **RESEARCH METHODOLOGY**

The principle underlying in this research is that a procurement system should be examined skeptically in terms of its suitability to a certain PESTEL setting. This principle is an extension of the systems view to construction procurement contributed by Rowlinson (1999). This investigation thus adopts PESTEL as an analytic framework. PESTEL analysis, standing for Political, Economics, Social, Technological, Environmental, and Legal, is a framework of macro-environmental factors used in the environmental scanning component of strategic management. It also gives an overview of the different macro environmental factors that a procurement system has to take into consideration.

Bearing in mind the PESTEL framework, the authors investigate various sources by using a literature survey in order to truly understand the ACS in China. There are three prevailing books (Zhang, 2008; Yin and Yan, 2006; Hou, 2006) about the ACS. The understanding of the ACS was enhanced by a body of articles published on different journals but being organized under a Project Manager Union (2010) website. Archived papers, presentations and in particular keynote speeches by governmental officers in the First National Summit on "Agent-Construction System: theories and practices" provide very useful literature for this study. The search of the literature was further enhanced by using a CNKI database for research papers. All the literature on the ACS is in Chinese. This presents a possibility that information will be lost in the translation but it also provides a chance for cross referencing by perusing them in two languages. The literature survey has projected the procurement system into China's PESTEL background, which is changing rapidly, though in various speed.

The second stage of this research adopts interview as the main method for investigating the ACS in China. Interviews allow for an in-depth interpretation of the comparisons. Three interviews have been conducted. Somehow, these took place over a long period with the first one being conducted in December of 2009 with the vice president of an international construction company and the last one in December of 2010 with a government officer in charge of audit of government-invested projects including those adopted the ACS. Each interview lasted 40–60 minutes and the transcriptions are used to cross validate the understanding from the previous literature survey. The data from the literature survey and interviews is to be analyzed in the next section.

## ANALYSES, DISCUSSIONS, AND FINDINGS

### General PESTEL Background for public project procurement in China

In order to effectively understand the Agent-Construction System (ACS), it is necessary to relate the system with China's PESTEL background. China is known as a socialist country adopting a Marxism-Leninism ideology. Based on this ideology, a centrally planned economy system has been adopted and there was no private sector. Since 1978 when the country adopted an "open-door" policy, the economy has been reformed from the traditional planned economy to a market economy. Lu (2009) used the spectrum as shown in Fig. 1 to illustrate the transition of the economy systems. Yang (2004) also effectively summarize that all the significant affairs taken place in China since 1978 can be understood by putting them into two spectrums similar to Fig. 1, one for political reform and the other for economy. It can be seen from the spectrum that gradually economic activities and factors of production are configured by the market as "the invisible hand" instead of a central plan. The zigzag of the curve represents its struggling with two briefs of "plan (state planning)" and "market (incentive-based competition)", which were traditional labeled as "socialism" and "capitalism" respectively. Whilst Western economists argue that these two are not natural partners, it is generally accepted in China that "government planning and market regulating are two integral parts of the socialist market economic system". It should allow the market to allocate factors of production and to increase efficiency while the central planning is indispensable in ensuring healthy development of the whole economy. Although the market economy is now dominant, the whole economy system still has a strong "planning" culture. For example, the economic goals have been achieved through its "Five-Year Plans", which are a series of economic development initiatives shaped by the Central Committee and National Congresses to map strategies for economic development, set growth targets, and launch reforms. Currently, it is in the 12<sup>th</sup> "Five-Year Plans" (2011-2015). As a result of the economy reform, China's GDP grows at an average rate of about 10%, reaching a GDP of \$4.99 trillion in nominal term in 2009, becoming the world's second largest economy after the United States.



*Figure 1: An illustration of economic reform in China*

Intertwined with the political and economic development is its unprecedented urbanization in China. Urbanization has been the major drivers of China's GDP growth over the past decades and it will become even more so over the next 20 years. According to the UN World Urbanization Prospects (UN, 2009), the level of urbanization in China is 46.1, with a population of 620million living in urban areas, while this level will be 73.2 in 2050 and the urban population will be 1 billion. A McKinsey report (2009) forecasted that 1 billion people

will live in China's cities even early in 2030, and 5 billion m<sup>2</sup> of road will be paved, 170 mass-transit systems could be built, and 40 billion m<sup>2</sup> of floor space will be built in 5 million buildings by 2025. These resonate with China's fixed-asset investment on property, roads, and other infrastructures to sustain the economic growth as well as the urbanization ambition. For example, in 2009, the total fixed-asset investment was 22,486 billion Yuan (NBS, 2010). Although the government investment system is in transition, for example, in 2004, a regulation named *Decision on Reforming the Government Investment System* was promulgated by the Chinese State Council, the government is still dominant in both the public spending and the procurement of government-invested facilities driven by the urbanization. Normally, there are two types of government-invested projects: (i) non-profit-making, for example, urban roads, schools, hospitals, libraries, museums, government offices (These are called institutional buildings in Hong Kong), and (ii) profit-making utilities, i.e. water, gas, sewage facilities, tolling roads, bridges and tunnels, etc.

In the face of the ambitious urbanization plan, Chinese government is keen to introduce innovative procurement systems that can help materialize the huge demand of public projects. Various writers (e.g. Liu, 2001; Zhang, 2007) summarized a genealogy of the typical government public procurement systems as follows:

(a) Self-build model, in which the end users (i.e. a university, or a hospital), more precisely, their long-standing project organizations, are in charge of the construction projects. They define project scopes, apply for budget from the government, and procure the project by themselves;

(b) Government construction commanding units model, in which a temporary governmental unit was set up to command the budgeting and construction of a given project, e.g. a road committed by a local government. The project will be transferred to the end users after completion.

(c) State-owned construction enterprises model, in which the State-owned enterprises are in charge of the construction of a project. For example, for Ministry of Railway (MOR), Ministry of Transportation (MOT), Ministry of Construction (MOC), they had their own construction bureaus which later were transformed to state-owned construction enterprises in charge of specific types of projects (i.e. railway, road infrastructure, and residential buildings).

Later, the market-oriented economy reform introduced competition. The competitive bidding and tendering has changed the system of construction project financing from traditionally government-free allocations to loans from commercial banks, and changed the project procurement system from traditional government assignments to competition through the tendering process as occurs in international practice (Shen and Song, 1998). But for the public projects, the government is still dominant in financing and procurement, mainly through the National Planning Commission, although it was renamed to the National Development and Reform Commission (NDRC). Public clients are remaining as various state-owned organizations; the construction commanding units model is still seen every now and then (e.g. Shanghai Expo 2010) while for some profit-making public projects, a Legal

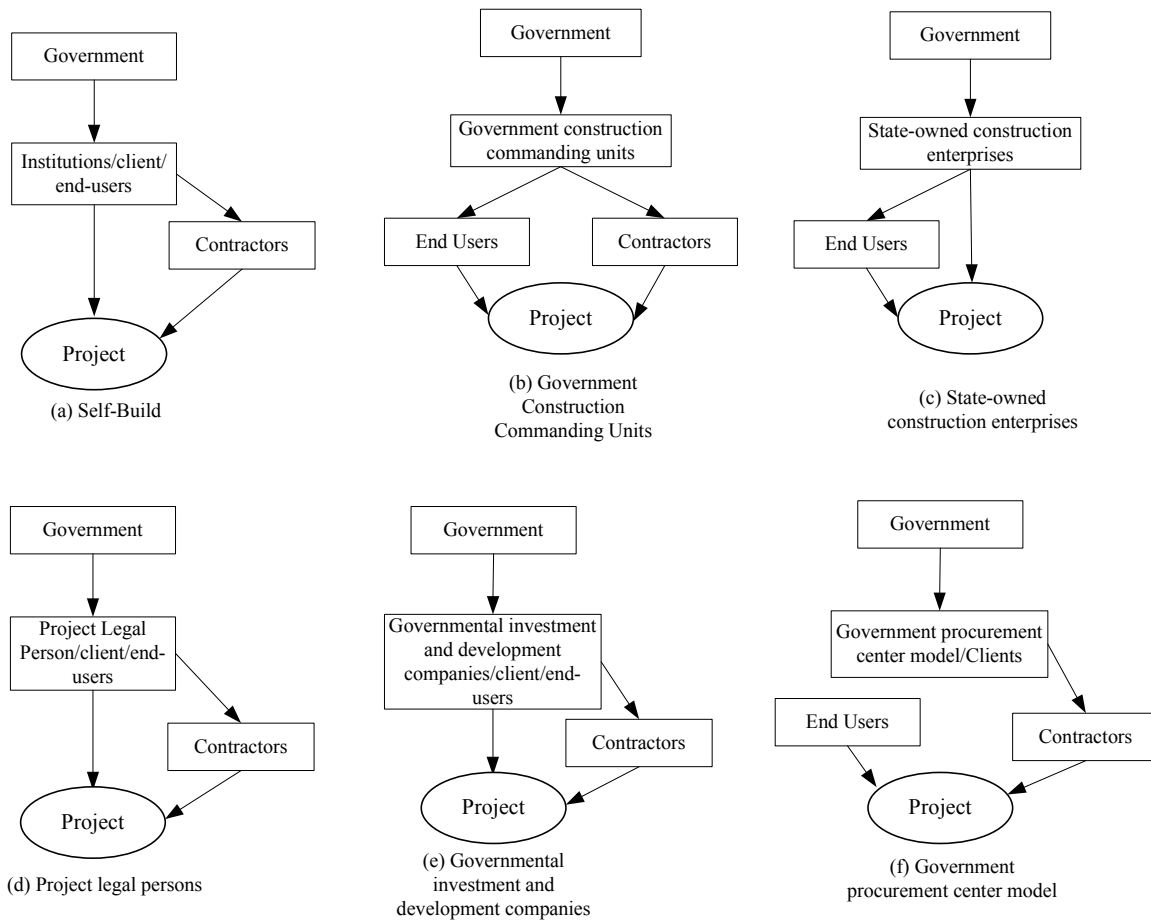
Person system (e.g. Water Affairs Group Limited; Road and Bridge Corporations) is adopted as a legal entity to be responsible for the profit and loss of the projects. The state-owned construction firms were pushed into a competitive market and became real companies that are responsible for their own gains and loss. The above procurement systems, with a label of the planned economy, have been changed with the transition of the whole economy system. More diversified procurement systems appeared, for example:

(d) Legal person model, in which a project company will be set up as a legal entity, usually a qualified and authorized organization, to take charge of the procurement and also operation of the construction project.

(e) Governmental investment and development companies. This model is not significantly different from the Model (d) above but this one should be responsible for the financing of a project thus return of investment is of high concern.

(f) Government procurement center model, in which a government procurement center is established to be in charge of procuring a project which will be transferred to the end-users after its completion.

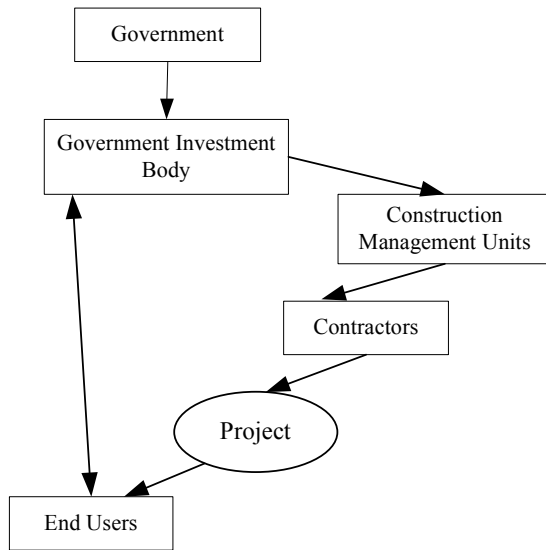
With a closer investigation, it can be summarized that the above models have actually struggled to streamline the relationships between government (as both a market regulator and a client), project contractors (state-owned or private enterprises), and end-users (often the public sector). Typical relationships between the parties underlying in different procurement systems can be seen in Fig. 2. The relationships could be underlying in any government investment project in any economy but this is more important as an issue in China which adopted a socialist economy. It is believed that the unclear relationships are the main causal factor for problems in public procurement. For example, budget overrun is widespread as a result of enlarging project scope by end users; quality is poor as no professional construction management is in place; rent-seeking in these relationships leads to misconduct and corruptions. The Agent Construction System (ACS) and the exotic systems such as PPP, PFI, and BOT, etc were introduced under this particular PESTEL background.



**Figure 2:** The relationships of government, contractors, and end-users in various public procurement systems

**Agent-Construction System (ACS or Dai Jian Zhi)**

It is generally agreed that the ACS was firstly trialed in Xiamen in 1993 and formally introduced in 2004 when the Chinese State Council issued a regulation named *Decision on Reforming the Government Investment System*. The term firstly appeared in the *Decision* in which it was stated that for procuring government-invested non-profit-making projects, professional construction management units are selected through competitive bidding and tendering to conduct the construction projects, to control project cost, quality, and time, and to turn over the projects to the future users or operators after they are successfully constructed. Similarly, the relationships in an ACS is illustrated in Fig. 3.



**Figure 3:** *The relationships of government, construction agents, contractors, and end-users in the Agent-Construction System*

By comparing Fig. 3 with Fig. 2, a major difference observed is that the construction management units (CMUs) are selected as an agent of the government investment body, through competitive bidding and tendering, to conduct a certain or all stages of construction projects, i.e. feasibility study, design, contracting, construction and handover after completion, meanwhile to strictly control project cost, quality and time. The ACS, therefore, is considered by many researchers as the construction management system originated in the U.S. This view places an emphasis on that the CMUs, with more professional knowledge than the government investment body or end-users, can help overcome the problems in procuring public projects. There is another view considering that the ACS can overcome the problems by streamlining the relationships amongst the parties. After the project was completed, it will be transferred to end-users, who applies for a project from the very beginning, while has no intervention during the execution of the project. All the details of rights and obligations are required to be clearly specified in an agent-construction contract, and so are the risk sharing mechanism and dispute solving approaches. Through this way, it is hoped that budget overrun can be reduced as end-users cannot enlarge project scope any more, and quality can be improved by introducing the CMUs. The latter view emphasizes a clear definition of rights and obligations of various parties that are involved in a public projects. Both views are correct while more analyses are needed to clarify the many ambiguities in the ACS.

The *Decision* only addresses a general principle (Yan et al., 2009) while applicable procurement systems are subject to detailed elaborations by individual provinces, autonomous regions and municipalities. For example, the government investment body could be Provincial Development and Reform Commissions (PDRC) themselves (e.g. in Beijing), or their authorized institutions (i.e. in Shanghai Chengtou Corporation as a professional industrial investment group company engaged in the construction and operation of the city's



infrastructure facilities), or tender users (i.e. the model in Chongqing). According to Zhang (2008), the last mode should not be regarded as the ACS. In addition, the professional CMUs could be professional project management companies which are complete legal entities, or government specially-set institutions which are extended government executive arms (e.g. Bureau of Public Works in Shenzhen). Actually, the latter form is not significantly different from the model (f) governmental procurement center as illustrated in Fig. 2. With different combinations of government investment bodies and CMUs, a wide variety of procurement systems which are generated and all claimed to be ACS. Yin (2008) summarized there are three models of ACS in China: Beijing Model with Beijing DRC as the investor and professional CMUs as the construction agent, Shanghai Model with project investment corporation and professional CMUs, and Shenzhen Model with government as the investor and Works Bureau as the agent.

During the course, there emerge various forms of ACS that respectively embody some features and strengths/weakness of emerging procurement modes such as BOT, PFI, EPC, or BT, which are more familiar to the construction and project management fraternity. Some state-owned companies, with their relatively strong financing, architecture, engineering, and construction capabilities, acted as the government's agent in procuring projects. Instead of operating for a certain years as BOT does, the projects will be completely purchased back by the government after 2 to 5 years. This model is reported as successful to create a win-win situation by complementing with each other using each party's strengths. It also reduces each party's weaknesses while introducing a risk sharing mechanism that is critical to the success of public construction projects.

Although there is no consensus on what the ACS is, it has become a widespread procurement system in China. According to Yan et al. (2009), by the end of 2008, 45 out of totally 47 regions including provinces, municipalities and special provincial-level cities in the mainland China have issued their guidelines on how to conduct the ACS in line with the *Decision*. In many regions, the ACS has been made as a mandatory system while in some others the system is promulgated with greater flexibility when procuring government-invested non-profit-making public projects. According to Yin (2008), by the end of 2005, there were 153 completed, 164 ongoing, and 85 planned projects adopting the ACS. The Beijing 2008 Olympic Games projects also adopted this procurement system. The discussions of the pros and cons of the system have been prolific. All these provide a good standing point to compare the ACS and PPP in China.

### **The ACS and Procurement Innovation**

Hughes et al. (2006) suggest that to define procurement, the following six aspects of procurement must be defined at the same time:

- 1) ownership, initiation and funding, e.g. owner-financed, public sector-financed, developer financed, PFI;
- 2) selection method, e.g. negotiation, partnering, frameworks, selective competition, open competition;

- 3) price basis, e.g. work and materials as defined by bills of quantity, whole building, a fully-maintained facility, performance;
- 4) responsibility for design, e.g. architect, engineer, contractor, in-house design teams;
- 5) responsibility for management, e.g. client, lead designer, principal contractor, JV; and
- 6) amount of sub-contracting, e.g. 0-100%.

Innovation could be taken place in one or more aspects as listed above. Furthermore, the combination of these aspects provides a wide range of innovative procurement options. Their work provides a framework for analyzing the ACS as a procurement innovation here.

*Ownership, initiation and funding:* The adoption of ACS has not changed the fact that the public sector is still dominant in initiating, funding, and owning non-profit-making public projects. Unlike some governments which are suffering from lack of fund, Chinese government is relatively rich due to closely monitored fiscal policy and high saving rate of Chinese people. This mainly explains why PPP, PFI, BOT are not really popular in China. This ACS actually tries to streamline the relationships between investors, owners, professional management units, and contractors so as to overcome the problem of budget overrun.

*Selection method:* The ACS clearly stated that competitive bidding and tendering will be adopted in the selection of construction agents. However, this has not been fully implemented in some forms of ACS, for example, the Shenzhen model, similar to many other things, which copied from Hong Kong. Further studies to investigate the effectiveness of a similar system in two different PESTEL settings are envisaged.

*Responsibilities for design and management:* The ACS is much superior to other procurement systems for shifting the responsibilities for design and management to professional CMUs. As shown in Fig. 2, the part of responsibilities was traditionally assumed by government or its executive arms, which are not necessarily professional in design and management of public projects. Instead of managing individual projects, government was liberated by the system and can focus on regulating efficient market rules. It is through professional design and management that the problems of budget overrun, poor quality, and delayed delivery are expected to be reduced.

*Price basis and sub-contracting:* In the ACS, the issues were left to the professional CMUs with several principles. For providing the professional services, the construction agent will receive a service fee plus some incentive schemes.

*Risk sharing mechanism:* While has not been mentioned in Hughes et al.'s work, risk and reward allocation is critical for the success of an innovative procurement system. The ACS, particularly for the form similar to BT, creates a win-win situation by reasonably considering the risks bore by each party. It is noteworthy that instead of 30 years as PFI promises, 2-5 years is a reasonable period that the risk associated with the PESTEL background, changing in a high speed, can be handled by both the governments and the construction agents.

## CONCLUSIONS

In the face of widespread problems in public project procurement such as cost overrun, low quality and delayed delivery, governments worldwide are searching for innovative procurement systems that can help procure projects in a more efficient way and thus truly deliver values to the society. The ACS is reported as successful in China's particular Political, Economics, Social, Technological, Environmental, and Legal (PESTEL) background, although its many weaknesses are yet to be eliminated. The innovations of the ACS are lying in two aspects: (a) clearly defined right and responsibilities; and (b) appropriate allocation of resources and risks amongst parties involved.

The ACS reported herein can be treated as a "good practice" in project procurement that may provide valuable reference to readers. A word of caution, nevertheless, is that readers should not follow this "good practice" slavishly. The main proposition of this paper is that one ought to truly understand the essence of procurement innovation and devise suitable innovative procurement systems in a given PESTEL setting. Further research is suggested to investigate a national guideline on the ACS, the service fee for the construction agents. But if aiming to provide more references to other economies in procuring public projects, research may be directed to devise a more thoughtful risk sharing mechanism that takes into consideration each party's strengths, weaknesses, rights, responsibilities, and rewards respectively.

Nevertheless, a word of caution is that readers should not follow one specific "good practice" slavishly. One ought to truly understand the essence of procurement innovation and devise suitable innovative procurement systems in a given PESTEL setting.

## ACKNOWLEDGEMENTS

This research was sponsored by the Seed Funding Programme for Basic Research at the University of Hong Kong, HKSAR.

## LITERATURE

- ANDERSON, S. D., FISHER, D. J. & RAHMAN, S. P. 2000. Integrating constructability into project development: a process approach. *Journal of Construction Engineering and Management*, 126, 81.
- Egan, J. (1998). *Rethinking Construction (the Egan Report)*. Department of the Environment, Transport and the Regions, HMSO.
- Hou X.C (2006), *Finance-Construction on Consignment of the Public Work Project*, Chang Hong Press (in Chinese).
- Hughes, W., Hillebrandt, P., Greenword, D., Kwawu, W. (2006), *Procurement in the construction industry: the impact and cost of alternative market and supply processes*, Taylor & Francis.

- McKinsey & Company (2009), *Preparing for China's Urban Billion*, McKinsey Global Institute.
- NBS (2010), *The statistical yearbook of China, 2010*, China Statistics Press, Beijing.
- Project Management Union (2010), *Construction Project Management – The Agent-Construction System*, <http://www.mypm.net/special/daijianzhi/default.asp>. [Accessed: 12-Nov-2010]
- Rowlinson S.M. (1999), A Definition of Procurement Systems, In: *Procurement Systems: A Guide to Good Practice*, S. Rowlinson and P. McDermott (eds.). U.K., E & FN Spon, 27-53.
- Shen L Y & Song W (1998) 'Competitive Tendering Practice in Chinese Construction' *Journal of Construction Engineering & Management ASCE*, 124(2), 155-161.
- Yan, M. and Zhou, G.D. (2009), The State and Problems of Agent Construction System of the Government Investment Projects in China, *Journal of Beijing Institute of Technology*, 11(5), 31~37 (in Chinese).
- Yan, M. Yan, L., and Yin L.L. (2009), Research on the Present Situation and Problems of Agent Construction System for Government Investment Projects based on Project Critical Governance Factors, *Shanghai Economic Review*, 8, 33~41 (in Chinese).
- Yang, J.S. (2004) *Political Fights in China's Reform Age*, Excellent Culture Press, Hong Kong (in Chinese).
- Yin, Y.L. (2008), *Theory and Practice of Agent Construction*, Tianjin University of Technology (in Chinese).
- Yin, Y.L. and Yan X.G. (2006), *Theory and Practice of the Agent-construction in Public projects*, Tianjin University Press (in Chinese).
- Zhang W. (2008), *The Theoretical and Practical Issues of the Agent-construction of Public projects*, Copyright Publisher (in Chinese).
- Zhang W. and Zhu H.L. (2007), Institutional transformation of government project management in China, *China Civil Engineering Journal*, 40(5), 79~84 (in Chinese).