An overview of the Chinese construction market and construction management practice

Article *in* Journal of Technology Management in China · June 2007

DOI: 10.1108/17468770710756103

CITATIONS
25

READS
1,339

4 authors, including:

Patrick X. W. Zou
Swinburne University of Technology
135 PUBLICATIONS **5,367** CITATIONS

SEE PROFILE

Dongping Fang
Tsinghua University
139 PUBLICATIONS **6,386** CITATIONS

SEE PROFILE

Shou Qing Wang
Tsinghua University
110 PUBLICATIONS **4,811** CITATIONS

SEE PROFILE

The current issue and full text archive of this journal is available at
www.emeraldinsight.com/1746-8779.htm

An overview of the Chinese construction market and construction management practice

Patrick X.W. Zou
Faculty of Built Environment, University of New South Wales, Sydney, Australia
Dongping Fang and Shou Qing Wang
Department of Construction Management, School of Civil and Hydraulic Engineering, Tsinghua University, Beijing, China, and
Martin Loosemore
Faculty of Built Environment, University of New South Wales, Sydney, Australia

Abstract

Purpose – This paper aims to provide useful information and suggestions for future improvement in relation to China's construction industry and market. With China's rapid economical development and its entry to the World Trade Organization (WTO), much attention has been paid to the China construction business opportunities. However, not much information is available on the history, practices and business cultures of the Chinese construction industry.

Design/methodology/approach – Through literature review and interviews with industry professionals, this paper discusses the Chinese construction industry in terms of its market and management practice with a focus on tendering processes, contract management, project on-site supervision and occupational health and safety (OHS) issues. It also discusses the challenges that face the Chinese construction industry.

Findings – China has gone over a long way in construction tendering, contract management and OHS. Its current practice is in the right direction. However, further development and improvements are necessary.

Originality/value – This paper provides useful information to Chinese construction personnel for future improvement. This paper also provides useful information to overseas companies who are planning to enter China's construction market in the near future.

Keywords China, Construction industry, Tendering, Occupational health and safety

Paper type Research paper

Introduction

According to a survey conducted by China Statistics Press in 2000 and 2001, the construction industry in China accounts for approximately 7 percent of gross domestic product since mid-1990s and the employment in construction also accounts for about 7 percent of the total urban permanent employment in China. Furthermore, at the end of year 2003, there were totally 48,688 registered firms employing 37.8 million people working in the construction industry, creating a total output of 2,186.5 billion Yuan which is about 300 billion US $ (Shang *et al.*, 2006). These figures clearly indicate the

Journal of Technology Management in China
Vol. 2 No. 2, 2007
pp. 163-176

1746-8779
DOI 10.1108/17468770710756103

scale and importance of the construction industry sector in the economic development in China.

With its entry to the World Trade Organization (WTO), China provides significant business opportunities for both the local and overseas construction related professionals including real estate investment, design, construction and facility/property management. The Chinese construction industry is preparing for the challenges of relatively open trade in its hitherto, inaccessible markets. The main challenges for Chinese and foreign companies relate to the different histories, cultures, expectations and practices which differentiate the world's construction industries. Understanding and adjusting to these differences will be the key to success in this new era of open competition. While there is much information available on the history, practices and cultures of western construction industries, little is available on the Chinese construction industry. Therefore, this paper aims to provide an overview of the Chinese construction market and its management practice. After a brief review of the currently available literature, the paper discusses the industry in terms of tendering practice, contract management, on-site supervision and occupational health and safety (OHS) issues. The paper then discusses the challenges faced by all concerned. The paper concludes with recommendations for future improvement. The paper should be informative for those consider seizing the construction-related business opportunities in China. The paper should also be appealing to the Chinese construction professionals and researchers in finding ways for their performance improvement.

Related past research

Topics related to the Chinese construction industry have received academic interest in the English-language literature since the commencement of the country's economic open door policy in 1978 (Xu *et al.*, 2005). Some research has been focused on China's reform agenda and progress. For example, Mayo and Liu (1995) discussed the reform agenda of Chinese construction industry and Chen (1997) studied the impact of Chinese economic reforms upon the construction industry, including the relationships between construction and investment and national economic. Luo and Gale (2000) introduced the evolution of the Chinese construction industry with a specific focus on construction management and administrative system and the roles and functions of Ministry of Construction (MOC). More recently, Bajaj and Zhang (2003) discussed the management issues in relation to the construction industry development in China, including the traditional construction management, the formation of project supervision, organizational structure and its key activities while Lam and Chen (2004) reviewed China's Construction Law and Bidding and Tendering Law.

There is also research focused on China's construction tendering. For example, Lu and Zhang (1987) who has reviewed the research on allocation of construction works through competitive tendering. Shen and Song (1998) examined the development and characteristics of competitive tendering practices in the Chinese construction market, through postal surveys and interviews, and pointed out that a number of key issues required the Chinese Government's attention, such as partial competition, inconsistency of procurement documentation, construction triangular debt, challenge to the state-owned construction enterprises and legal control. Chan *et al.* (1999) also reviewed the tendering system in China and the management difficulties encountered.

More recently, Lai *et al.* (2004) discussed in detail the tendering method used in Beijing Municipal with a real case study and they pointed out that the current method is insensitive to an important criterion "bid price". They also pointed out that different cities were using different criteria with different components. However, they stated that with the introduction of competitive tendering, the corruption in the industry has been battled whittled down (but they did not provide any evidence apart from the number of detected and reported cases). They finally commented that China's tendering system still has a long way to go to match up with international best practice. Zou (2007) provided an overview of the Chinese construction project tendering and discussed the issues of value for money, and assessment of construction plans submitted by bidders.

Tendering practices

Historical development

Tendering has been used in Western countries for more than 200 years while in China, the practice of procuring building and civil engineering works through tender dates back to the turn of the last century (Wang *et al.*, 1998). Following the Opium War (1839-1842), China was forced to open to Western countries and the tendering procedure was brought into the country, mainly in the coastal areas and major urban centers. From the time that People's Republic of China was established in 1949-1957, the tendering approach was abandoned in favor of a system in which the government allocated major portion of construction works to local construction enterprises, through a contracting system – a contract was entered between the government agencies and a construction company who undertook the construction work and provide for the obligation and liabilities of parties of the contract. According to Wang *et al.* (1998), the contracting system worked quite well during this period.

However, from 1957 to 1978, the Chinese construction industry suffered sever setbacks from many political fluctuations (Shen and Song, 1998), such as the "great leap forward" that happened in the late 1950s, and the "cultural revolution" that happened in the 1960s and 1970s (Shen, 1990). The contracting system was abandoned during this time period (Wang *et al.*, 1998) and the government was not only responsible for freely providing all of finances for construction works but was also responsible for assigning projects to construction companies. Project clients were various state-own organizations, whose management staff had no responsibility for the overrun of budgets and construction time. There was no competition among construction companies because they were considered non-profit-making sector in the national economy. The government reimbursed all construction costs and there was no system for the control of project cost or construction time (Shen and Song, 1998). Project cost estimation and time programs were primary used for the government to allocate finance and resources and not for construction management. The Chinese construction industry, under such policies, systems and environment, was generally very inefficient and ineffective.

In 1978, the Third Plenary Session of the 11th Central Committee of the Communist Party of China declared China's economic reforms and open-door policies. The State Construction Commission (the predecessor of the MOC) therefore prepared and issued the Recommendations on Contracting Capital Construction Projects in April 1979. The Recommendations required that a contract be entered into between the client and

construction company who is to build a state project. Based on these recommendations, tendering system was adopted formally in Shenzhen Special Economic Zone for allocation of construction works in 1980. The tendering system was quickly approved as effective in shortening completion time, improving quality and lowering costs of construction works and has been influential in shaping central government policy from that point onwards.

On 17 October 1980, the State Council issued the "provisional regulations on developing and protecting the socialist competition" which specified that procurement of some construction projects suitable for contracting outside Shenzhen could use the competitive tendering systems. This was the first governmental document to propose implementation of the competitive tendering system and this was expanded by the "open-door" policy of the 1980s when the government set up a number of guidelines and regulations to change two key issues – project financing arrangements from traditionally governmental allocation to loans from commercial banks and project procurement system from governmental assignment to competition through a tendering process. In May 1984, a national tendering system was adopted as a measure for reforming the Chinese construction industry during the Second Plenary Session of the Sixth National People's Congress and thereafter the government promulgated a document related to construction industry reform requiring that the tendering system be used for construction works. The State Planning Commission and Ministry of Construction (1984) jointly issued the first official regulation promoting and governing the application of competitive tendering methods in Chinese construction (Shen and Song, 1998). Since, then tendering system has been becoming popular in Chinese construction market (Shen and Song, 1998; Wang *et al.*, 1998). It was estimated that, in 1988, 25.4 percent of the total completed building floors went through competitive tendering process and in the more developed cities this figure was over 60 percent (Wang and Lu, 1996).

Although the tendering system become popular in the late 1980s, until 1990s, cost as a single tendering parameter was used as the only or major measure of the tender submission with the assumption that time and quality requirements would be met by all companies. Furthermore, due to the lack of control measures, the problem of unfair competition quickly grew to be the most serious problem in the construction market and this problem not only caused many complaints, particularly from state-owned firms for being not able to find jobs, but also brought the problem of bribery for the purpose of obtaining project contracts (Shen and Song, 1998). Significant doubts were raised about the openness and fairness of a system where state-owned firms won the majority of projects. Because some firms could not secure jobs, many construction personnel found themselves unemployed. This situation was critical and presented a strong and urgent need to the introduction of a proper management system governing the tendering practice. Consequently, in 1992, the MOC issued a new regulation specifying management measures for controlling tendering practices (MOC, 1992). The regulation specifies tendering procedures and regulates the management roles and functions that various government departments should take to ensure fair competition in the market (Shen and Song, 1998). The implementation of the regulations was effective in controlling the inundation of many problems in the market. However, governmental bureaucracy in applying the new rules gradually became a barrier for further development of the competitive tendering system, leading to higher project

costs and delay (Wang and Jiang, 1994 cited in Shen and Song, 1998). This showed that government intervention in tendering process could maintain a reasonable market for a short time but it would become a serious barrier to its long-term development (Shen and Song, 1998).

As a result of the above problems, a growing body of people formed the opinion that tendering practices should be controlled by law rather than by governmental administration action. Consequently, the establishment of a legal system for tendering practices has become the most recent aspects of reform and the government has been developing relevant regulations and laws for this purpose. As such Tangible Construction Markets was introduced in 1995 and on 30 August 1999, the Ninth National People's Congress approved the tendering law which was enacted from 1 January 2000. At the same time, education and training has become an important channel to promote tendering legislation.

Current practice

Tender evaluation criteria

In China, the tendering evaluation criteria have evolved from a single-price criteria to multi-criteria that include price (cost), time, quality, etc. All tenders are assessed by a tender evaluation committee and the detailed tender evaluation criteria are prepared by this committee one day before the opening of the tenders, to avoid any unfairness in the tendering process. The selection of a best suitable company for the construction work is not based on the rule of "lowest price wins" but a multi-criteria, including price, time, quality and construction plan and company's reputation as well as proposed project team. This is normally done by a score system (normally to a total of 100-point), each bidder being given a score within the predetermined range, such as the components listed below (Jiangsu Provincial Construction Commission, 1999):

- Price: ≥ 50
- Construction plan/strategy: ≤ 20
- Quality and time: ≤ 5
- Project team (project manager's qualification and performance, etc.): ≤ 10
- Company past performance and financial capacity: ≤ 10
- Company reputation: ≤ 5

Generally, the construction contract will be awarded to the company obtained the highest score/point. Some terms and conditions applied to each of these selection criteria. There are specific measures placed against each of these criteria, and the following sections will discuss the price component and construction plan component.

Price component

First, the client (or its representative) will prepare an estimation of the project cost which is called "baseline price" (in Chinese term is called "Biao-di"). This is then used to derive what is called a "reasonable price" ($P_{\text{reasonable}}$). This formula combines baseline price (P_{client}) and the average price of the bids prices submitted by all companies (P_{bidder}) using weighting factors (α and β), as presented by equation (1):

$$P_{\text{reasonable}} = \alpha P_{\text{client}} + \beta P_{\text{bidder}} \quad (1)$$

where: $P_{\text{reasonable}}$ – is the weighted reasonable price, α – is a factor with a value set by tendering evaluation committee and it normally in the range of 0.3-0.7; P_{client} – is the "baseline price" determined by the client or its delegates who is qualified cost engineer; $\beta = 1 - \alpha$; P_{bidder} – is the average price of all the submitted validated bids.

All bids are compared to this "reasonable price" a score is given to each bid on the basis of how close is the bid to the "reasonable price" ($P_{\text{reasonable}}$). The bid closest to this "reasonable price" gets the highest point. Points are deducted to the submissions whose prices are either above or below this "reasonable price". In other words, the bid that is equal or closest to the reasonable price gets the highest mark, and 3-4 marks are deducted for every 1 percent of increase or decrease in price.

Construction plan component

The construction plan is worth of up to 20 points and is evaluated by the selected experts according to the following criteria if:

- the construction method is advanced and reasonable/logical;
- the construction plan is scientific, reasonable/logical, and reliable;
- the quality and safety strategies are reliable;
- site layout and occupational measure is reasonable/logical and reliable;
- main construction plant and equipment and labor allocation is reasonable; and
- the project team (including management and technical personnel) is capable.

The government guidelines recommend that, unless there are major mistakes in the construction plan, the points given to each bid should not be less than 60 percent of pre-determined maximum points.

Where to from here?

Despite the major progress made to date, the Chinese construction project tendering still has a long way to go to match up with international best practice (Lai *et al.*, 2004). There are a number of issues requiring Chinese Government departments' urgent attention.

The first issue is the tender evaluation criteria. Research found that the current method is insensitive to an important criterion "bid price" and different cities were using different criteria with different components (Lai *et al.*, 2004). Other issues which were surfaced in mid-1990s but still requiring the Chinese Government's attention, include partial competition, inconsistency of procurement documentation, construction triangular debt, challenge to the state-owned construction enterprises and legal control (Shen and Song, 1998).

The issue of value for money also requires attention. Zou (2007) raised the concerns on value for money for construction project procurement. The concern centers on the practice of deducting evaluation points from the bidders whose price falls below the established reasonable price. Obviously, this method works against any bidder who is more efficient or innovative, as he is discouraged to bid a price below the "reasonable price" due to the fact that he will lose points and therefore unlikely to be the winning bidder. A possible alternative approach would be to give extra points at a set scale for the amount they fall below the "reasonable price". The bidders who bid below the reasonable price may be interviewed and questioned on how they

derived their bid price, and provide evidence to prove that they are able to carry out the work more efficiently than their competitors. This manner will motivate contractors to improve their work efficiency and be more innovative.

Another issue is related to assessment of construction plans. The time given to the experts to evaluate all bid submissions (mainly the construction plans) is normally half to a full day with a small payment in the range of $50-200 RMB. Half to one day is insufficient to assess four or more construction plans comprehensively, particularly in the case where the experts are not given any information regarding the project nor the plan itself.

Contract management

The contractual arrangements in China fall into three broad categories depending upon the means of arriving the contract sum, which are lump sum contract, measurement contract and cost reimbursement contract. In November 1991, The MOC and the State Administration for Industry and Commerce (1991) jointly issued a standard form of contract for works of building construction, that is, model conditions of contract for works of building construction (GF-91-0201). After eight years in use the GF-91-0201 was revised, with FIDIC (International Federation of Consultant Engineers) contract conditions as one of the references, and renamed as conditions of contract for works of building construction (GF-1999-0201) in December 1999. In addition to GF-1999-0201, the other central ministries have also issued standard conditions of contract suitable for the works of civil engineering construction under their supervision. For example, the ministry of water conservancy, the ministry of electricity and the State Industrial and Commercial Administration Bureau jointly issued the conditions of contract for works of hydraulic and water conservancy engineering construction in September 1997.

In the late 1970s, several Chinese state-owned construction enterprises, with the help of Hong Kong businessmen, began to undertake construction contracts outside mainland China, exposing the Chinese construction community to international contract conditions for building and civil engineering construction, including the FIDIC conditions of contract for works of civil engineering construction. Since, then FIDIC has been used extensively in China and experience shows that most of the civil engineering works procured under the FIDIC conditions have turned out very successfully. The Chinese employers find that the project management practice and the employment of an impartial engineer, as provided for in the FIDIC contract, have been key factors for the successful development of projects. FIDIC signifies a high level of sophistication in construction project management to the construction sector in China. FIDIC is then highly regarded and well known throughout the industry. The construction sector increasingly needs engineers who are fully conversant with the principles of the FIDIC contracts, to bring its human resources to the same standard as those of the engineers engaged from overseas.

On-site project supervision

The Chinese Government requires construction projects clients (owners) to enhance on-site supervision. On-site project supervision process is essentially the responsibility of the supervisory company, which is usually appointed by a competitive selection process. The supervisory company's operation is governed by relevant state/provincial laws. In terms of the State and Provincial Bidding Laws, clear

procedures exist which regulate the reporting processes used by clients, contractors and supervisory companies following contract award. In essence, supervisory companies formally report to clients on a weekly basis through meetings and monthly written reports. The monthly reports contain information about materials supplied; variations; quality issues; progress against schedule; financial status; major issues identified from past weekly meetings.

Additionally, the supervisory company is required to report on quality matters, on an end of project basis, to the quality control station, a government body. This end of project report consists of a work summary which primarily deals with quality and design compliance issues. All contracts/projects are required to be audited at "practical completion" stage. This audit is essentially a final account audit, and must be instigated by the client. This audit will identify final project cost and reconcile the makeup of this final price. For government funded projects, the government audit bureau conducts the audit while the non-government funded works are audited by an accredited specialist audit company.

The design institute also participates in supervision of project work, specifically at pre-determined milestones such as reinforcement placement. Additionally, any variations which are significant require design institute concurrence. Attendance at other times may be sought by the client.

Occupational health and safety (OHS) management

With the rapid development of construction industry in China, severe safety problems were experienced. There were 25 millions practitioners in the construction industry in the early 1990s and this has risen to about 37.8 millions in 2003, representing about 25 percent of the construction practitioners in the world. Owing to several reasons including the characteristics of industry, qualities of workers, and developmental level of society, the construction industry in China has been the second most dangerous industry following the coal mining industry.

Figure 1 shows the numbers of practitioners, fatal accidents, (severe injuries and death) rate per 10,000 in 1980-2003. In 2001, there were 1,292 fatalities; in 2002, the fatal accident rate was 7.55 per 10 billion production value; in 2003, there were

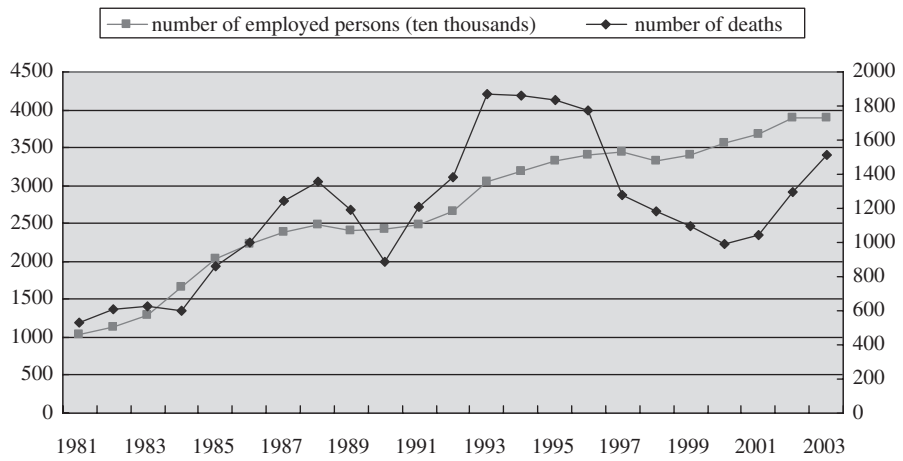

Figure 1.
Numbers of employed persons and deaths in construction industry (1981-2003)

1,512 fatalities, and the fatal accident rate was 6.92 per 10 billion production value. The number of fatalities was 2,607 in 2005 (Shang *et al.*, 2006). It is clear that both the total number of employment and the general trend of number of deaths increased with some ups and downs over the years.

OHS laws and regulations

To improve construction safety, a series of laws, regulations and technical codes have been enacted in China in recent years. The Labor Law (1995), the Construction Law (1998) and the Law of Working Safety (2002) are the three most important ones that regulate construction safety. These three laws jointly form the foundation for enforcement.

The Labor Law of the People's Republic of China was enacted on 1 January 1995, with the aim of protecting laborers' rights and interests and regulating working relations. The Labor Law prescribes the basic rights and obligations of workers and the responsibilities of employers. This law comprises regulations covering working contracts, social insurance and basic wages, working hours, holidays, labor dispute resolution and work supervision. The sixth chapter of the Labor Law, namely Labor Safety and Health prescribes the principles for dealing with safety and health problems that might emerge at work. Typically, it requires employers to maintain safe and healthy working conditions, and assigns workers the right to safe and healthy working conditions. However, due to the over-supply of labor in China, people in the construction industry often work against low wages and long hours. Cases where the law is broken are common due to uncontrolled market behavior and the limited resources available for its enforcement. Moreover, the clauses relating to safety are limited and not defined in detail to be useful in ensuring adequate inspection and enforcement. Unless serious accidents happen, contractors are unlikely to be reprimanded.

The Construction Law of the People's Republic of China came into force on 1 March 1998. This Law prescribes that the MOC, under the State Council, supervises the nation's construction practice and regulates the market behavior of the construction industry. The fifth chapter of the law, namely construction safety management, specifically sets out the structure for safety administration in the construction industry. First, it expresses construction safety management policy in the form that "precaution is the first focus for managing safety". Second, it sets out the safety requirements for each process in the project cycle including design, construction and commissioning. For example, contractors are required to take responsibility for all safety on construction sites, including the establishment of a proper system of education and training for construction safety. To promote safety of the workers, the law stipulates that "the contractor must insure all worker against accidents" and that "workers have the right to criticize, prosecute and accuse employers or others for any action that may cause hazards to their safety or health." Likewise, "the construction administrative department is responsible for the management of construction safety." As this is the basic law regulating the construction industry, many clauses are not specific. Therefore, local legislation and some ordinances consistent with the Construction Law and the Law of Working Safety, is expected to be established which must be more specific to cover deficiencies.

The Law of Working Safety of the People's Republic of China came into force on 1 November 2002. As the principal instrument in the legislative framework for working safety, this law sets out requirements for the behavior of all forms of enterprises and

the workers employed. As a foundation for government administration, the Law of Work Safety is a powerful weapon designed to overcome the illegal actions of employers. In order to implement and administer the law, further practical measures are set out to enforce the law and deal with offenders.

The Construction Engineering Safety Management Ordinance came into force on 1 February 2004 and it is the first regulation focusing on the construction safety in China. In the ordinance, the qualification of construction enterprises and construction permit system are stipulated, the safety responsibilities of all stakeholders in the construction activities are stated, and the supervision and management system of working safety are described. Punishment for illegal behavior is described in detail in the ordinance. First, criminal responsibilities are put on the owner, designer, construction and supervision enterprises according to the Criminal Law. Second, civil responsibilities of economic compensation are required for illegal behaviors such as using unqualified construction enterprises as well as criminal responsibilities. Third, administrative penalty is much bigger than before. Fourth, the certified practitioner who violates the Ordinance will be punished, and the enterprise's qualification certificate will be canceled and cannot be re-certified within five years or longer.

Government's supervision role in OHS

In 1991, The MOC requested all local government departments to establish construction safety supervision stations in counties and other administrative regions. Up to 2002, safety supervision stations were established in 24 provinces and directly governed municipalities, forming a safety supervision network with 1,300 safety supervision stations and 8,000 safety practitioners. In addition, The State Administration for Work Safety was founded in February 2001 to govern and supervise work safety. This is an extra layer of safety supervision institution, which indicates the government's commitment for supervising and managing safety at work. The differences of responsibilities on safety supervision between MOC and State Administration for Work Safety are: the former is responsible for the safety in construction industry, while the latter is to govern and coordinate the safety work in all industries. In construction industry, the supervision role of State Administration for Work Safety is transferred to MOC.

Current OHS issues

In China, there has been rapid economic development since the 1980s resulting in enormous pressures on safety at work. The steps taken to improve safety at work have been much slower than the pace of the economic development. Although, accident rates have begun to reduce and legislation has begun to emerge, the pace of economic development continues unabated and the conflict between rapid-developed economy and poor safety infrastructure is still unresolved. There continue to be many challenges in improving safety in the Chinese construction industry, and urgent attention need to be given to low investment in safety infrastructure, lack of safety techniques and safety management systems, inadequate evaluation on unknown hazards, poor safety attitude, inadequate safety training and education, and poor safety culture. The following sections discuss in details some of these issues.

The occupational safety supervision functions are over decentralized and overlapped. In other countries, the safety supervision function is usually undertaken

by one administration. But in China, there are three administrations responsible for safety supervision: state administration for work safety is responsible for safety at work, ministry of labor and social security for work injury insurance, and state administration for quality and technique supervision for boiler and machine (lift and crane) safety supervision. This results in a confusion of responsibilities, poor communication and differences in regulations and standards relating to occupational safety and health across China. In addition, problems also exist in safety regulations and provisions (Shang *et al.*, 2006):

- the regulations and standards are prescriptive but the sanction arrangements for non-compliance and violations are still ambiguous; and
- the legislative provisions are fundamentally unsatisfactory and vague while the supporting legal instruments are fragmented and sometimes repetitive.

Therefore, it is necessary to revise, amend and combine the existing scattered legislative provisions to establish a comprehensive deterrence-based prescriptive legislative framework and control regime; it is also necessary to reform the enforcement authorities to implement clear, frequent and stringent enforcement campaign (Shang *et al.*, 2006) and enhance coordination and cooperation between different departments in safety and health issues.

At company and project levels, the benefits of safety supervision are difficult to be understood by enterprises. Owing to the scarcity of effective laws and regulations, many enterprises tend to close their eyes to the outcome of safety supervision and seldom take actions to improve their safety. The enterprises' internal safety supervision is weak. In the past, most of the enterprises, especially the large and medium ones, are national government-owned enterprises. With the rapid development of economics and increase of the number of private enterprises, economic performance too often takes priority over safety performance, which makes safety supervision more difficult. Furthermore, there is no safety management department and officers in some enterprises. As such it is urgently necessary to help construction firms establish and adopt self-regulated safety and health management system and specify safety responsibilities of the owners and designers (Shang *et al.*, 2006; Hinze, 2006). In the journey of developing safety culture, the strategies and systems used in some overseas companies may be useful: and these include Bovis Lend Lease's "Incident and Injury Free" Strategy (Zou *et al.*, 2006), Gammon's "Safety first – a moral responsibility" framework (Smyth, 2006) and Bechtel's "Safety as a value" for safety synergy (Berg, 2006).

In short, although great improvement on construction safety management and safety performance in China has been achieved over the last two decades, there are still problems, including inadequate technical standards and regulations, poor safety culture and inadequate government supervision.

Recommendations and conclusions

The aim of this paper was to provide a historical overview of the developments in the Chinese construction industry in terms of, tendering processes, contract award and management process, on-site construction supervision, and OHS issues. It has shown that while the Chinese construction industry has begun adapting to the market-driven principles, there are still many challenges facing its future development and

improvement, such as value for money, time, quality and safety management. It should be noted that these four aspects are inter-related. The authors therefore suggest that China enhance and integrate its tendering practice, contract management, on-site project supervision and OHS practice into one database/system. For example, the government, and clients (its representatives) should strengthen its role in on-site project supervision and keep complete site records. Develop a scoring system to record contractors' performance in terms of cost, quality, time and safety as well as environmental impacts. Provide incentives to the companies who have better performance in OHS in "call for tender and tender evaluation". Use standard contracts for all projects, include OHS detailed requirements (terms and conditions) in construction contracts.

Since, China has opened its market to the world through entering the WTO, and many construction projects are now procured by foreign construction companies, there is a need for the Chinese Government to consider if its tendering method is suitable for international competitions. A fundamental difference between China and the Western market price system is that China has opted for a "reasonable price". The authors' contention is that unpredictable social, economic, technical and political aspects of a globalising society will force organizations to look at forming national and trans-national business alliances (McGeorge *et al.*, 2003). The authors therefore suggest that China benchmark its construction management practice to those of the Western so that to find the best ways that suits China's special situation which is market-driven economic in a socialism environment.

References

Bajaj, D. and Zhang, R. (2003), "Managing construction industry development in China", *AACE International Transaction*, INT.04, pp. 1-6.

Berg, K. (2006), "Synergy for success effective construction safety and health management", in Fang, C. and Hinze, J. (Eds), *Proceedings of CIB W99 International Conference on Global Unity for Safety and Health in Construction, China, 28-30 June*, Tsinghua University Press, Beijing, pp. 34-7.

Chan, W.K.L., Wong, F.K.W. and Scott, D. (1999), "Managing construction projects in China – the transitional period in the millennium", *International Journal of Project Management*, Vol. 17 No. 4, pp. 257-63.

Chen, J.J. (1997), "The impact of Chinese economic reforms upon the construction industry", *Building Research and Information*, Vol. 25 No. 4, pp. 239-45.

Hinze, J. (2006), "Construction safety: plateaus of success and mountains of opportunity", in Fang, C. and Hinze, J. (Eds), *Proceedings of CIB W99 International Conference on Global Unity for Safety and Health in Construction, China, 28-30 June*, Tsinghua University Press, Beijing, pp. 12-19.

Jiangsu Provincial Construction Commission (1999), "Jiangsu Province regulations on the procedure of call for tendering, tender open, tender evaluation for construction projects", Ordinance No. 335, p. 10.

Lai, K.K., Liu, S.L. and Wang, S.Y. (2004), "A method used for evaluating bids in the Chinese construction industry", *International Journal of Project Management*, Vol. 22, pp. 193-201.

Lam, Y.T. and Chen, Z.G. (2004), "The development of the construction legal system in China", *Construction Management and Economics*, Vol. 22, pp. 347-56.

Lu, Q. and Zhang, Y. (1987), *Tendering Manual for Construction Projects*, China Construction Industry Press (China Building Press), Beijing (in Chinese).

Luo, J. and Gale, A. (2000), "The evolution of the Chinese construction industry", *Building Research and Information*, Vol. 28 No. 1, pp. 51-8.

McGeorge, D., Palmer, A. and Zou, P.X.W. (2003), *Construction Management in a Market Economy*, China Architecture and Building Press, Beijing, p. 200.

Mayo, R.E. and Liu, G. (1995), "Reform agenda of Chinese construction industry", *ASCE Journal of Construction Engineering and Management*, Vol. 121 No. 1, pp. 80-5.

Ministry of Construction (MOC) (1992), "Management method of tendering and bidding for construction projects instrument", Ministerial Documents, No. 23, Beijing, December 30 (in Chinese).

Ministry of Construction (MOC), and State Industry and Commerce Administration (1991), "Standard building contracts", Beijing, March (in Chinese).

Shang, C.M., Fang, D.P., Zhang, X. and Mak, D. (2006), "The strategy for construction safety and health in China towards year 2020", in Fang, C. and Hinze, J. (Eds), *Proceedings of CIB W99 International Conference on Global Unity for Safety and Health in Construction, China, 28-30 June*, Tsinghua University Press, Beijing, pp. 3-11.

Shen, L.Y. (1990), "Application of risk management to the Chinese Construction Industry", PhD thesis, Reading University, Berkshire, pp. 132-134 and 176-180.

Shen, L. and Song, W. (1998), "Competitive tendering practice in Chinese construction", *ASCE Journal of Construction Engineering and Management*, Vol. 124 No. 2, pp. 155-61.

Smyth, D. (2006), "Safety – an overwhelming moral responsibly and a key strategic business issue", in Fang, C. and Hinze, J. (Eds), *Proceedings of CIB W99 International Conference on Global Unity for Safety and Health in Construction, China, 28-30 June*, Tsinghua University Press, Beijing, pp. 20-1.

State Planning Commission and Ministry of Construction (1984), "Provisional regulation on tendering for construction projects", Beijing, November (in Chinese).

Wang, B. and Jiang, H. (1994), "The review of tendering practice", *Journal of Construction Market and Tendering*, Vol. 3, pp. 3-14.

Wang, S.Q. and Lu, Y.J. (1996), "Bidding for construction works in China", *Proceedings of CIB Beijing International Conference Conseil International du Batiment, Beijing, China*.

Wang, S.Q., Tiong, R.L.K., Ting, S.K., Chew, D. and Ashley, D. (1998), "Evaluation and competitive tendering of BOT power plant project in China", *Journal of Construction Engineering and Management*, Vol. 124 No. 4, pp. 333-41.

Xu, T., Tiong, R.L.K., Chew, D.A.S. and Smith, N.J. (2005), "Development model for competitive construction industry in the People's Republic of China", *ASCE Journal of Construction Engineering and Management*, Vol. 131 No. 7, pp. 844-53.

Zou, P.X.W. (2007), "An overview of China's construction project tendering", *International Journal of Construction Management*, Vol. 7 No. 2.

Zou, P.X.W., Windon, S. and Mahmud, S.H. (2006), "Cultural change towards construction safety risks, incidences and injuries: literature review and case study", in Fang, C. and Hinze, J. (Eds), *Proceedings of CIB W99 International Conference on Global Unity for Safety and Health in Construction, China, 28-30 June*, Tsinghua University Press, Beijing, pp. 629-39.

Further reading

Lu, Y.J. and Wang, S.Q. (2002), *China's Thriving Construction Industry*, Southeast Asia Construction, Trade Link Media Pvt Ltd, Singapore (invited cover story paper), September/October, pp. 96, 98, 100-105 (Chinese edition), pp. 106-113 (English edition).

Lu, Y.J. and Wang, S.Q. (2004), *Project Management in China*, Southeast Asia Construction, Trade Link Media Pvt Ltd, Singapore (invited cover story paper), September/October.

Ministry of Construction (MOC) (1993), "Regulation on management of building contract", Beijing, January (in Chinese).

National Bureau of Statistics of China (1980-2004), *China Statistical Yearbook 1980-2004*, China Statistics Press, Beijing, available at: www.stats.gov.cn

People's Congress of China (1999), *Tendering Law of the People's Republic of China Practical Questions and Answers*, Legal System Working Commission, People's Congress of China, China Building Material Industry Press, Beijing (in Chinese).

Yang, J.S. and Zhao, X.S. (1990), *Working Manual for Tendering for International Construction Projects*, China Finance and Economics Press, Beijing.

About the authors

Patrick X.W. Zou is an Associate Professor and Director of Master of Construction Project Management Program, Faculty of Built Environment at University of New South Wales Sydney Australia. Patrick X.W. Zou is the corresponding author and can be contacted at: P.Zou@unsw.edu.au

Dongping Fang is a Professor and Deputy Director, Institute of International Engineering Project Management, Tsinghua University, Beijing, China.

Shou Qing Wang is a Professor and Deputy Head of Department of Construction Management, School of Civil Engineering, Tsinghua University, Beijing, China.

Martin Loosemore is a Professor and Associate Dean (Research), Faculty of built Environment, University of New South Wales Sydney Australia.