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# The Construction Industry in China: Its Bidding System and Use of Performance Information

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This paper describes the rapid development of China's construction industry and especially its bidding system. After summarily depicting the history, scope, employees and contractors in China's construction industry, the paper identifies that even after nearly thirty years' development, the sector is still harassed by the problems of low productivity, unskilled employees, unsophisticated technologies, inadequate legal framework and flawed mechanism. This paper also points out that the status quo of performance information in China's construction industry still leaves much to be desired, and that in order to merge into the global market, China has made much effort to introduce the competitive bidding mechanism and the method of evaluated lowest bidding price to the industry. Via picturing the course of using the method of evaluated lowest bidding price in China's construction industry, the paper also characters why and how the performance information is used in the sector. At the end of the paper, it is pointed out that although some certain district has made some efforts to use performance information, most Chinese scholars and government officials are still convinced that the method of evaluated lowest bidding price does accord with the market-oriented trend and should certainly be widely adopted in the future.

**Keywords:** Construction industry; China; Bidding system; Performance information

## 1. Introduction

Since the implementation of the reform and opening-up policy in the early 1980s, the Chinese economy, and in particular its construction sector, have seen some very dramatic changes (MOC 2003, MOC 2007b). As a key component of the construction industry, the bidding system has also changed greatly (Lai et al. 2004, Song et al. 2006).

This paper aims to describe these changes and analyze the status quo of China's construction industry and particularly its bidding system. Since China is a vast country, with many autonomous and distinct parts, there are major differences between regions. The paper focuses on mainland China.

## 2. Overview of China's construction industry

### *2.1 History since 1949*

Before 1980 the construction industry was just regarded as a subordinate work force giving effect to the state's fixed capital investment program (Lu et al. 2001). Many people, including certain top government officials, believed that construction activities only involved simply assembling the materials made by other economic sectors to form building and civil engineering works, adding no value to the total social product. The construction enterprises were under the direct supervision of the central ministries or local governments, and their operations were

restricted by the supervisory government agencies to certain sectors and/or geographical areas. As a result, most of them lacked horizontal mobility and experience in other sectors. The enterprises had little autonomy with regard to obtaining workload, and they had to wait for the government agencies to assign construction works to them. The technical and managerial personnel and the skilled field workers and laborers were allocated by the supervisory government agencies. Building materials, construction equipment, working capital and other inputs were also allocated by the government as part of the central planning process. The entire industry could thus be viewed as a single large enterprise with a centralized hierarchical organization where factors of production and other resources were allocated almost exclusively through administrative channels.

The obvious weaknesses of the system hindered the healthy development of the construction industry and the problem became more serious as time went on. The central government eventually realized this problem when Mr. Deng Xiaoping pointed out in 1980 that the construction industry could be a profit-making industry as an important productive sector and should be treated accordingly. Subsequently the situation started to change in the early 1980s and a series of reform programs have been introduced into the construction industry. By introducing a market mechanism into the construction market and moving away from the constraints of the planned economy, these reform programs have greatly accelerated the development of the construction industry, already one of the backbones in China's economy (MOC 2006, Chen et al.2005).

### 2.2 Scope over time

In terms of its size, China's construction industry is relatively huge. As shown in Fig. 1, the annual production from the construction industry between 1978 and 2007 ranged from 3.8% (1978) to 5.6% (2007) of the Gross Domestic Product (GDP) with output value of up to 1185.11 billion Renminbi (RMB) (NBSC 2007).

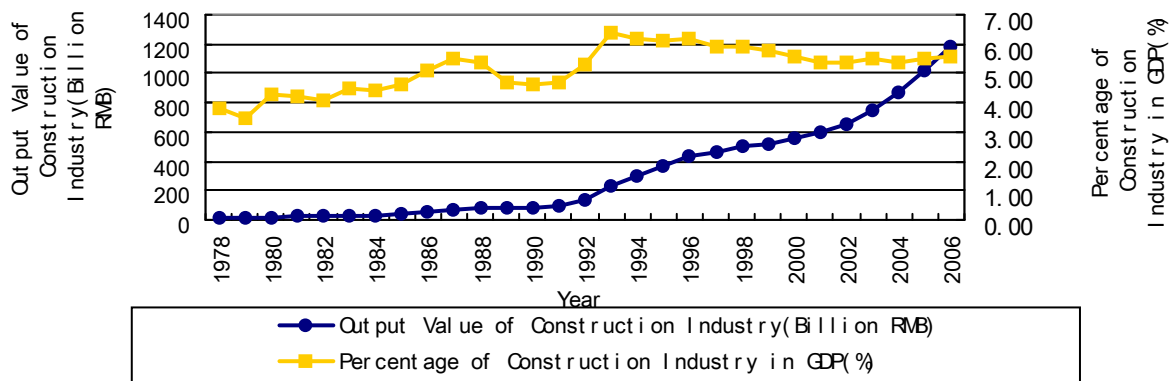


Figure 1: Contribution of the construction industry to GDP.

From Fig. 1 it can also be seen that there was fall in construction's contribution to GDP in 1989 relative to 1988. This fall is attributable to the austerity program that the Chinese government was forced to implement in order to cool down the overheated economy and the inflation in

1988. The ‘property heat’ that occurred following the speeches made by Deng Xiaoping when making his tour of southern China in the spring of 1992, urging reform and economic development, accounts for the sharp growth of construction’s contribution to GDP in 1992 and 1993 relative to the previous years.

### 2.3 Employees

Since China has the biggest rural population in the world, the increasing agricultural productivity and decreasing arable land are releasing and pushing the rural population to the urban centers. Therefore, there is plenty of labor available to the construction industry. The overall status of workforce employed in China’s construction industry is shown in Fig. 2.

The number of employees in the construction industry (shown in Fig. 2) covers everybody who is working in the construction industry at the end of each year, whether they are being paid a salary, wage or otherwise. It includes all the work force that takes on construction activity in both urban and rural areas. It can be seen that in 2004 in excess of 42 million people were involved in construction activity, comprising almost 5.61% of the total employed persons in all sectors (NBSC 2007).

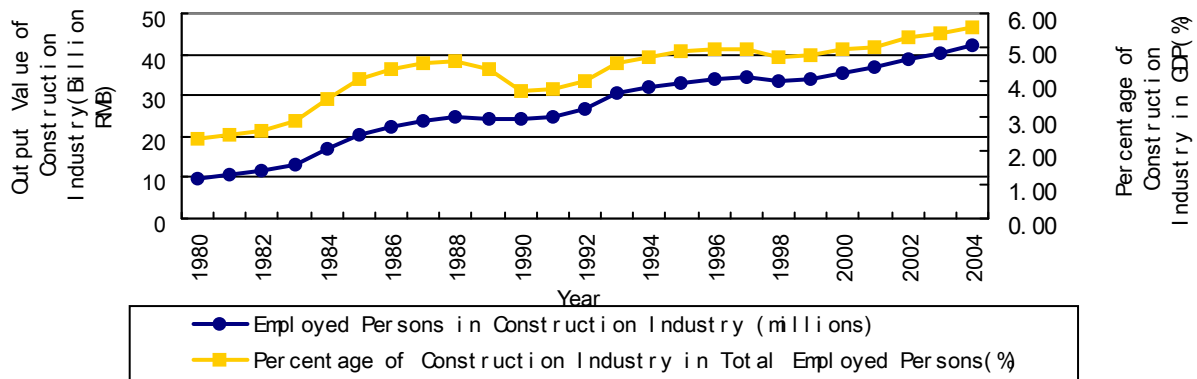


Figure 2: Employees in China’s Construction Industry.

### 2.4 Contractors

At present, the contractors in China’s construction industry can be classified into eight distinct types in terms of ownership. They are state owned enterprises, urban and rural collectives, private firms, joint venture, Hong Kong, Macao and Taiwan contractors. The construction work force other than the above seven types is referred to as other firms. Among all of these contractors, state owned enterprises in the construction sector are the primary undertakers of the national fixed capital investment program and dominate the domestic construction market.

Table 1 enumerates the top 10 Chinese contractors ranked by their total 2006 construction contracting revenue, both at home and abroad. All of these top 10 contractors are state owned enterprises. The world rank in table 1 shows that these state owned contractors still could be described as huge while compared with their international counterparts.

Table 1

***The Top 10 Chinese Contractors in 2006***

Rank	World Rank	Company	General Contracting Gross Revenue (\$millions)	Domestic (\$millions)
1	3	China Railway Engineering Corporation	21,295.9	20,637.6
2	6	China Railway Construction Corporation	17,326.8	16,912.0
3	7	China State Construction Engineering Corporation	16,146.9	13,190.8
4	10	China Communications Construction Group (Ltd.)	14,734.4	11,353.7
5	18	China Metallurgical Group Corporation	11,628.0	11,321.0
6	30	Shanghai Construction (Group) General Co.	6,276.3	5,696.3
7	63	Dongfang Electric Corporation	2,803.0	2,650.0
8	66	Beijing Construction Engineering Co., Ltd. (Group)	2,782.5	2,687.1
9	68	Zhejiang Construction Investment Group Co., LTD.	2,715.3	2,573.2
10	76	China National Chemical Engineering Group Corporation	2,100.4	1,733.1

Note. Source: ENR (2007).

Companies are ranked by their total 2006 construction contracting revenue, both at home and abroad.

Prior to 1984 most of the state owned construction enterprises were general contractors executing all trades needed to complete construction works. It was subsequently found that it is an inefficient industrial organization. A reform program called “Separation of management from field operations” was launched in 1984. Some of the enterprises were reorganized as specialty companies, while the others were management-oriented. As a result, the construction enterprises now in China can be classified as general contracting enterprises, specialty enterprises and labor-only enterprises. General contracting enterprises normally act as general contractors and represent the majority of the construction enterprises in China. Specialty companies are further sub-classified into several subcategories based upon their specialties, such as excavation, piling, foundation, mechanized construction, equipment and machinery installation, fitting out and finishing, urban utilities and public works.

Some main economic indicators of general contractors and specialty sub-contractors in China’s construction industry in 2006 are shown in Table 2. While the ratio of pre-tax profit to gross output value of all Chinese construction contractors in 2006 is 5.98%, the ratio of net profit is only 2.62%, which is much lower than that of enterprises in other sectors (NBSC 2007).

Table 2

***Main Economic Indicators on Contractors in 2006***

Item	Total	General Contractors	Specialty Sub-contractors
Number of Enterprises (unit)	60166	33175	26991
Number of Employed Persons (million persons)	28.78	25.26	3.52
Gross Output Value of Construction (billion RMB)	4155.72	3603.33	552.39
Ratio of Pre-tax Profit to Gross Output Value (%)	5.98	6.05	7.51

Note. Source: NBSC (2007).

## 2.5 Major problems

While enjoying booming development, the construction industry is still harassed by many problems, making the construction industry ranked as a weak sector of the economy by international standards. Some of these problems are low productivity, unskilled employees and unsophisticated technologies, inadequate legal framework and flawed mechanism (MOC2007, MOC 2006, Xu et al. 2005, Low et al. 2003).

### 2.5.1 Low productivity

In China's construction industry, output per employee is a measurement of productivity (NBSC 2007). The productivity measured by output per employee in the Chinese construction industry is much lower than that in developed countries. In 2000, the average number of employees of Chinese construction enterprises was 31 times more than that of the United States, while the output per person of Chinese construction enterprises was approximately 23 times less than that of their U.S. counterparts that year (Xu et al. 2005).

### 2.5.2 Unskilled employees and unsophisticated technologies

China's construction industry is a highly labor-intensive sector and lacks high-level talents. Most of the employees in the construction industry are unskilled or semi-skilled workers who previously were farmers with no proper training for construction. At the end of 2000, out of 35 million employees, the engineering technicians and management professionals only accounted for 5.34% and 4.92% respectively, which are below those of other sectors in China (MOC 2003).

The sector is also characterized by inaction in adopting state-of-the-art technology for construction and management, such as the use of advanced equipments and information technology. Table 3 shows that power of machines per laborer of construction enterprises grows very slowly, to the extent that virtually no improvement occurred between 1995 and 2006 (NBSC 2007). Although the value of machines per laborer increased from 4264 RMB/person in 1995 to 9109 RMB/person in 2006, it is very low while compared with that of other sectors.

Table 3

#### *Machines Owned by Construction Enterprises*

Year	Value of Machines per Laborer (RMB/person)	Power of Machines per Laborer (kilowatts/person)
1995	4264	4.7
2000	6304	4.6
2005	9273	5.1
2006	9109	4.9

Note. Source: NBSC (2007).

### 2.5.3 Inadequate legal framework and flawed mechanism

To move away from the constraint of the planned economy, China's construction industry has achieved significant improvement through the reform of its industrial legal framework and mechanism; but this is far from enough. At present, the roles of government, construction

enterprises, and design institutes in the construction market have not been well defined, the mechanism and environment for the market-oriented construction enterprises have not yet been perfectly established, equal opportunity rules have not been fully applied to the construction market, and thus further discipline is needed for the desirable behaviors and relationships among the competing bodies in the construction market. As the status of the legal framework and mechanism are the key underpinnings of a country's construction industry, all of these macro problems need to be resolved as soon as possible.

### **3. Bidding system**

#### *3.1 History of the bidding system*

Contracting in construction in China dates back to the middle of the 19th century, when China was defeated in the Opium War (1839-1842) and was forced to open up to Western countries. Since then, many western contractors have come into China and set up many incorporated construction enterprises in major cities. They have tendered for construction contracts in a manner similar to that practiced in Western countries. The construction contracting practice was still in use before China began to adopt the planned economic system in the 1950s (Lu et al. 2001, Wang et al. 1998).

Under the old planned economic system in place from 1950s to 1980s, the Chinese government was not only responsible for freely providing all of the finances for construction works but was also responsible for assigning construction projects to contractors. The jobs of survey, design, construction and installation were all allocated by the governments according to the annual fixed investment plans. The contractors were various state owned enterprises or firms and their managers were not responsible for extensive delays in the planned schedule, cost overruns, quality problems, and so on. There was no competition among contractors and therefore no motivation since the contractors were not allowed to make profits as the construction industry was considered to be a nonprofit-making sector of the national economy (Lai et al. 2004). At the beginning the method worked quite well but it became less and less efficient as time went on. The major drawback was a lack of adequate incentive for the construction enterprises to make efficient and effective use of their resources.

In 1981, Shenzhen Special Economic Zone was chosen to try competitive bidding for the procurement of works. In 1982, a World Bank financed project, Lubuge Hydropower in Yunnan province used international competitive bidding for its procurement of works. Both of these attempts turned out to be very successful. Encouraged by the successes in Shenzhen and Lubuge Hydropower, the Chinese Ministry of Construction (MOC)<sup>1</sup>, in June 1983, issued "The provisional bidding procedure for construction and installation works" to all the local governments, encouraging construction enterprises to compete for their construction and installation works through competitive bidding. On 7 November 1984, the State Planning Commission and the MOC jointly issued a more detailed "The provisional regulations on bidding for construction works". This document was designed to promote competitive bidding in order to

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<sup>1</sup> Since 2008 March, the Ministry of Construction in China has been renamed as the Ministry of Housing and Urban-Rural Development.

shorten completion time, ensure quality, cut down costs and make more effective and efficient use of capital investment.

The two central government agencies also issued, on 14 June 1985, "The provisional procedure of bidding for design work" which stipulated that any large and medium-sized construction projects should be awarded by construction owners or the consulting company appointed by the construction owners through competitive bidding systems. It also stated that any organizations with design certificates, such as state-owned enterprises, collective and individual enterprises, could participate in bidding for projects for which they had been approved as being suitably qualified.

In December 1992 the MOC issued "Management methods of bidding for works of building and civil engineering construction" which stipulated that any newly built or rebuilt projects, projects to be expanded, and technology transformation projects to be financed by the government, publicly owned enterprises or institutions, should be delivered through the tendering procedure mentioned above.

As one of the most important pieces of legislation regulating market activities, "the Law of the People's Republic of China on bid invitation and Submission" was adopted by the 11th Meeting of the Standing Committee of the 9th National People's Congress on 30 August 1999 and took effect 1 January 2000. According to the law, fundamental facilities, public facilities, construction projects (including the project's survey, design, construction and supervision) and important equipment and materials relevant to the projects should be awarded through the system of inviting bids if the scales prescribed by the State are reached. This law is an important milestone in procurement market administration. Since its adoption, the competitive bidding system has been popularized over the whole country and has been applied not only to the construction and implementation of projects in the construction industry, but also in other fields such as design procurement, material supply, labor force supply, project supervision procurement and equipment supply. As shown in Table 4, the competitive bidding system has already become the dominant delivery method in China's construction industry.

Table 4

*Construction Projects Delivered through Competitive Bidding System in December 2006*

	Number (unit)	Proportion by Number (%)	Value (million RMB)	Proportion by Value (%)
<b>Delivered Projects</b>	2519	100.00	38466.08	100.00
<b>Projects Delivered through Competitive Bidding System</b>	2145	85.15	35429.83	92.11
<b>Projects Delivered through Open Bidding System</b>	1193	47.36	17297.47	44.97
<b>Projects Delivered through Selective Bidding System</b>	952	37.79	18132.36	47.14

Note. Source: MOC (2007a).

Data in this table only cover some main cities in China.

### *3.2 Project delivery systems*

Evolving from the planned economy to a socialist market economy, the majority of the construction projects in China are now delivered through the traditional design/bid/build route (Zheng et al. 2006). It was estimated in 2005 that only 10% of the domestic construction projects in China were using the general contracting mode at that time (Xing 2006).

There is no universal best delivery method. Every delivery method has its advantages and disadvantages (Wang et al. 2002, Sun 2003, Ding 2006). The Chinese government has also recognized that to optimally utilize resources, alternative delivery methods should be adopted according to different contexts and clients' needs (Yu et al. 2005). Although the general contracting mode has not been widely applied in China, the Chinese government has really made much effort to promote this mode in the construction industry since the middle of the 1980s (MOC 2003, Xing 2006). At the beginning of 2003, the MOC issued a guideline named "Instructive opinions on cultivation and development of the general contracting enterprises and project management corporations" which discussed the importance of carrying out general contracting. This guideline recommended placing general contracting into qualified projects and encouraged the corporations with the according qualification to develop the general contracting work. The general contracting referred in the guideline is mainly about the modes of Design/Build and Build/Operate/Transfer (BOT) (He 2004).

#### *3.2.1 Design/Build*

The Design/Build general contracting mode was first used in China, in 1984. This mode is particularly suitable for complex public sector projects where technological expertise is not available or when cost and time considerations are paramount. With its particular advantages, this mode has already entered into a rapid developing process and has been used by more and more projects, including the Jinmao Skyscraper, one of the tallest buildings in China.

#### *3.2.2 Build/Operate/Transfer*

The first BOT project in China, the Shajiao B Power Plant in Guangdong Province, was successfully transferred to the Chinese side in September 1999. The project, which was started in the beginning of 1989, had generated a total of 46.2 billion kWh of electricity by July 1999 (Zhou 2000). Due to the pent-up demands of infrastructure and the prospective private financing for China's long-term economic development, the BOT delivery route for infrastructure is now more attractive to local governments (Xu et al. 2005).

## **4. Performance information**

At present, the overall performance information in China's construction industry still leaves much to be desired. Some available performance information is listed in Table 5. Although quantitative data on overall project performance statistics seem to be in short supply, but reported instances of project failures to achieve promised quality, cost, or schedule do abound.

Table 5

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### ***Performance information in China's construction industry***

<b>Item</b>	<b>Performance information</b>
Quality performance	Only 13% could be ranked as "good quality"
On Budget Rate	27%
On Time Rate	12.85%

Note. Source: MOC (2006), Wang (2006).

The "On Budget Rate" and "On Time Rate" are only based surveys to some government investment projects.

#### *4.1 Quality performance*

Between September and November 2005, 200 construction projects all over the country were selected by the MOC at random to inspect the construction quality. The result showed that 24.3% of all inspected projects had violated related regulations, while only 13% could be ranked as "good quality" (MOC 2006).

#### *4.2 On Budget Rate*

China's construction industry is also suffering from the "Three Excesses" in investment, which can be described as that the budgetary estimate exceeds the provisional estimate, the budget exceeds the budgetary estimate and the final accounts exceeds the budget. The phenomenon of "Three Excesses" is particularly prevalent in the government investment projects. According to the Audit Bureau in Zhejiang province, the final accounts of 22 projects, accounting for 73% of the all 30 government investment projects they have audited since 2004, exceeded the budgets, and the total exceeded value amounts to 20.3% of the total budgets.

#### *4.3 On Time Rate*

Even with the introduction of some advanced construction technologies and more effective management techniques, delays in construction projects are still very common in China's construction industry. The result of a questionnaire survey on the schedule performance of 515 government investment projects in Shenzhen and Hong Kong showed that only 12.85% of the projects completed building contracts within the scheduled completion date, and that the average overrun reached 21.34% (Wang et al. 2006).

## **5. Use of performance information**

### *5.1 Bid evaluation methods*

According to "the Law of the People's Republic of China on bid invitation and Submission" issued in 1999, two main bid evaluation methods, i.e., the method of evaluated lowest bidding price and the method of comprehensive evaluation, are now used in China's construction industry (Wang 2007).

Generally the method of evaluated lowest bidding price is applied to the bid invitation projects that have general technological and performance standards or when the bid inviter has no special requirements for the technology and performance. According to this method, the bidding that has satisfied the substantial requirements of the bid invitation documents and has been evaluated to have the lowest bidding price shall be recommended as the candidate for bid-winning.

The method of comprehensive evaluation is often adopted for the projects that are not suitable to adopt the method of evaluated lowest price. According to the method of comprehensive evaluation, the bid that satisfies the various comprehensive evaluation standards prescribed in the bid invitation documents to the maximum limit shall be recommended as the candidate for bid-winning. To evaluate whether the bidding documents have satisfied the various evaluation standards prescribed in the bid invitation documents to the maximum limit, the method of currency conversion, the method of scoring or other methods may be adopted. After quantifying the technological part and the business part, the bid evaluation commission shall weight the quantification results of the two parts, figure out the comprehensive evaluation price or comprehensive evaluation score of each bidding, and select the best bidding.

### *5.2 Use of performance information*

As described in Section 3 of this paper, under the old planned economic system in place from 1950s to 1980s, construction works in China were directly assigned to contractors by government. In 1980s and 1990s, the bidding system began to be introduced to the industry and the method of comprehensive evaluation was advocated for construction projects bidding. During this time, however, many construction works were still awarded through “relationship”, and construction works were often awarded to contractors who had the “best relationship” with the bid evaluators rather than those who are the most competent, as a result, the problem of “Three Excesses” and construction corruption became more and more serious, urging the industry scholars and government officials to find some better bid evaluation methods.

Having realized that the method of lowest bidding price is being widely used in most Western countries, more and more Chinese scholars are convinced that this method should also be advocated in China (Wu 2002, Fang 2004, Li et al. 2005, Pan 2006, Wang 2007, Qin 2007). They argue that only in this way can China’s construction industry ameliorate its market-oriented system, save investments, reduce corruption, merge into the global market and catch up with those one-up international competitors.

At the same time, the practice of using the method of evaluated lowest bidding price has been implemented in some districts. On 1 April 2003, Xiamen, a municipality in Fujian province, issued “The procedure for adopting the method of evaluated lowest bidding price for construction projects” and became the first district in China to push the method of lowest bidding price forcibly. According to this procedure, projects that are totally or dominantly funded by the investment of State-owned funds should be bid by the method of evaluated lowest bidding price.

On 17 Feb. 2003, “The specification for the method of valuation with bill of quantities for construction projects (GB 505002 2003)” was issued by the MOC. Compared with the fixed price quotation method traditionally used in China, the method of valuation with bill of

quantities advocated in this specification is more compatible with the method of lowest bidding price. Since then, the method of evaluated lowest bidding price has been more and more used in China's construction industry.

While having taken many benefits to the industry (Pan 2006, Qin 2007), the method of evaluated lowest bidding price has also generated lots of problems (Yuan 2007, Song et al. 2006). On the one hand, compelled by the fierce competition, most of the bidders have to lower their bidding prices and reduce their profits, which may subsequently force them to: default the workers' wages and suppliers' payments, lower the quality of products or services, lodge more claims, and invest less to renew their equipments. On the other hand, as it is very difficult to judge whether the bidders' bidding prices are lower than their costs or not, the bid inviting parties always have to take on the risks of contracting with unqualified bidders and suffering from lower quality and increased claims.

In the process of using the method of evaluated lowest bidding price, the government has already realized the problems and has taken some measures to solve these problems. On 10 March 2004, about one year after adopting the method of evaluated lowest bidding price, Xiamen issued "Some regulations on further ameliorating the method of evaluated lowest bidding price for construction projects". According to this regulation, Xiamen decided to establish a database to record the performance information of contractors and use the bidders' performance information to judge whether they have the qualification to bid.

In 2005, Ningbo, a municipality in Zhejiang province, even officially abolished using the method of evaluated lowest bidding price to bidding construction projects. Meanwhile, Ningbo also decided to establish an information system to reveal the credit ranks of construction enterprises. The credit information system is supposed to be renewed every year and be referred to while using the method of comprehensive evaluation.

After researching into the problems generated in using the method of evaluated lowest bidding price, many experts have also realized that hindered by the unhealthy market mechanism of China's construction industry, this method should not be simply used in China without adopting some supporting measures, including ameliorating the insurance mechanism, establishing the credit system and so on.

However, most scholars are still convinced that the method of evaluated lowest bidding price does accord with the market-oriented trend and should certainly be widely adopted in the future. At present, they are focusing their research on how to ameliorate the method to make it compatible with the reality in China.

## 6. Conclusion

Over the last nearly 30 years China's construction industry has gone through an extraordinary phase of development, however, harassed by its low productivity, unskilled employees, unsophisticated technologies, inadequate legal framework and flawed mechanism, the industry still has few advantages to compete with its foreign counterparts. What's more, since China's

entering into the post WTO transitional period on December 11th 2006, the competition has become fiercer. Facing the fierce competition, the industry has no choice but to continue to reform and improve.

One of the most important things needed to be improved is the bidding system. To merge into the global market and catch up with those one-up international competitors, China has made much effort to introduce the competitive bidding mechanism and the method of evaluated lowest bidding price to the construction industry. However, after being frustrated by the problems generated in using the method of evaluated lowest bidding price, many people have realized that the method should not be simply used in China without considering the reality of China's construction industry. Moreover, in order to solve these problems, some districts in China have already made some attempts to establish databases to record the contractors' performance information and ameliorate the credit system in the industry, and Ningbo even officially abolished using this method to bidding construction projects and decided to establish an information system to reveal the credit ranks of construction enterprises. However, most Chinese scholars and government officials are still convinced that the method of evaluated lowest bidding price does accord with the market-oriented trend and should certainly be widely adopted in the future, and now they are focusing their research on establishing supporting mechanisms to guarantee the method could be healthily adopted in the industry.

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