



UNIVERSITY OF LEEDS

This is a repository copy of *Forms of collaboration & project delivery in Chinese construction markets: the probable emergence of strategic alliances & design-build* .

White Rose Research Online URL for this paper:
<http://eprints.whiterose.ac.uk/3625/>

Article:

Xu, T.J., Bower, D. and Smith, N.J. (2005) Forms of collaboration & project delivery in Chinese construction markets: the probable emergence of strategic alliances & design-build. *Journal of Management in Engineering*, 21 (3). pp. 100-109. ISSN 0742-597X

[https://doi.org/10.1061/\(ASCE\)0742-597X\(2005\)21:3\(100\)](https://doi.org/10.1061/(ASCE)0742-597X(2005)21:3(100))

Reuse

See Attached

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk
<https://eprints.whiterose.ac.uk/>

promoting access to White Rose research papers



Universities of Leeds, Sheffield and York
<http://eprints.whiterose.ac.uk/>

This is an author produced version of a paper published in **ASCE Journal of Management in Engineering**.

White Rose Research Online URL for this paper:
<http://eprints.whiterose.ac.uk/3625/>

Published paper

Xu, T J, Bower, D and Smith, N J (2005) *Forms of Collaboration & Project Delivery in Chinese Construction Markets: the Probable Emergence of Strategic Alliances & Design-Build*. *Journal of Management in Engineering*, 21 (3). pp. 100-109. ISSN 0742-597X

Forms of Collaboration & Project Delivery in Chinese Construction

Markets: the Probable Emergence of Strategic Alliances & Design-Build

Tianji Xu¹, N.J. Smith², D. A. Bower³

Abstract: The regulation that allows foreign contractors to qualify as wholly foreign owned 'construction enterprises' has come into effect since Sep 2002, as one of the steps of the Chinese government to honor its World Trade Organization (WTO) commitments. Strategic planning decides project deliveries of a foreign contractor, whereas emerging market of project deliveries may have significant impact on the strategic planning. Based on an electronic-survey covering foreign contractors, clients (foreign investors), and design institutes, design-build delivery has been found prevalent in foreign contractors' projects in China. A SWOT analysis of foreign contractors has been conducted. Collaboration with design institutes is essential for foreign contractors' sustainable growth, given the current construction environment in China. Among the various forms of collaboration, strategic alliance is revealed as the most appropriate form of collaboration for foreign contractors in China. Mutual-trust, synergistic strengths and complementarities, market demand for the services, flexibility for both parties, and minimum change of top managers have been ranked

¹PhD Student, School of Civil Engineering, The University of Leeds, Leeds LS2 9JT, U.K. E-mail: centx@leeds.ac.uk

² Professor, School of Civil Engineering, The University of Leeds, Leeds LS2 9JT, U.K. E-mail: n.j.smith@leeds.ac.uk

³ Lecturer, Member of ASCE, Construction Management Group, School of Civil Engineering, The University of Leeds, Leeds LS2 9JT, U.K. E-mail: d.a.bower@leeds.ac.uk

as top five critical success factors for strategic alliances between foreign contractors and design institutes. Finally, medium-sized, state-owned, and large-sized design institutes are rated as the 1st, 2nd, and 3rd respectively in the strategic partner selection of foreign contractors.

CE Database subject headings: Engineering firms; Strategic planning; Design/build; China.

Introduction

Given the current construction regulations and local resources availabilities, foreign contractors could hardly ever work alone in China without significant collaboration of design institutes. The forms of collaboration can be mergers and acquisitions, international joint venture, project based collaboration, or strategic alliance, as shown in Figure 1. Typically, Chinese construction enterprises are engaged as subcontractors in foreign contractors' projects. Design institutes could be more important than Chinese construction enterprises in terms of foreign contractors' corporate level strategies.

The role of design institutes is similar to that of design firms in Western countries (Xu et al. 2004). Design institutes tend to reinvent themselves to modern engineering consultants (e.g. multi- project delivery, better services mentality).

The pattern of foreign contractors' development in China in the context of collaborating with design institutes is highlighted in Figure 1. The Chinese construction industry is evolving under the impact of World Trade Organization (WTO), which promotes global trade

liberalization with the core criteria of market access and national treatment (Xu and Wang 2001). Foreign contractors may directly enter China construction market through various project deliveries, namely, design-bid-build, design-and-build, build-operate-transfer (BOT), and construction management.

The term "design-build" used in this research refers to the project delivery that entails the contractor undertaking or being responsible for whole process (i.e. project feasibility studies, design, procurement and build) or at least design and construct of construction. Design-and-construct, package deal, turnkey contract, design-and-manage, design-novation-build, engineering-procurement-construction (EPC), bridging and cost-plus are considered as variations of design-build project delivery method, which is consistent with the concept of "Gong Chen Zhong Chen Bao" in Chinese construction law (The Construction Law of People's Republic of China 1997).

Though foreign contractors might have realized some profits, a multitude of problems is often encountered, which include among others, high cost, disputes with local subcontractors and design institutes, frustrations with the local administration system, confusions about local construction practice, and conflicts with local partners. As foreign contractors can do little to change the Chinese construction market, it is important for them to investigate the market and find the most appropriate form of collaboration.

The purpose of this paper is to study the foreign contractors' design-and-build delivery in

post-WTO era's Chinese construction market, from which a framework of design-and-build using strategic alliance with design institutes for foreign contractors can be identified and developed. The research methodology used in this paper is to survey foreign contractors, design institutes and clients about forms of collaboration and success factors.

Literature Review

Design and construction works were assigned to design institutes and construction enterprises respectively by the government during the planned economy era (Mayo and Liu 1993). Competitive tendering design-bid-build procurement method was adopted in 1980's and become more popular in recent years (Wang et al. 1998).

Flanagan and Li (1997) highlighted areas that UK companies can 'invest' in China. These areas are finance and build-operate-transfer (BOT), technology and transfer of technology, management and consultancy skills, real estate development, design, construction, construction materials and components supply, education and training, environmental technology and others. But design-and-build has not been identified as an opportunity for foreign contractors.

Yang et al. (1997) studied project management practices of various types of enterprises (e.g. Computer and communication companies, light industry) in Pudong, China. Based on their survey, they argued that the project management in Pudong was behind those in West countries because more sophisticated project management techniques and computer-based

tools were seldom used. One of the drawbacks of their investigation is that no construction company is covered in enterprises they surveyed.

Shen and Song (1998) ascertained the China construction competitive tendering system. But no contractual issues about design-and-build were addressed. Wang (2000) presented foreign-local joint design problems in China. However, no specific project delivery has been indicated in the paper.

Pheng and Leong (2000) discussed cross-cultural management for projects in China based on a case study of a hotel construction. The paper identified many problems of communications between expatriates and local staffs of local partners and authorities. Though turnkey proposal from a foreign contractor was mentioned, the paper ignored the procurement process.

Luo (2001) reported that Sino-foreign construction joint ventures performed well, whereas a significant degree of risk in construction joint ventures in China due to the difference in management systems, technological practice, and cultural background between partners has been revealed (Shen et al. 2001).

Recently Meng (2002) studied the guarantee system for contractor's performance and client's payment in the Chinese construction industry. But the pitfalls for foreign contractors venturing in China have not been discussed. Xu et al. (2002) analyzed international

contractors' practice in China and offered integration approaches for international contractors.

The build-operate-transfer (BOT) project delivery in China has been discussed extensively (e.g. Wang et al. 1998, Ye and Tiong 2000). However, the emergence of design-build project delivery in China has received less attention in academy.

Research Methodology

The whole research consists of pilot studies, electronic-survey (e-survey), and case studies. Pilot studies were started in September 2001 and have been completed in 2002 (Xu et al. 2003). This paper is to report the main findings in e-survey. The case studies will be reported on a separate paper.

Based on the pilot study and an extensive literature review, an e-survey questionnaire has been set. Commencing at February 2003, the writers had contacted some of foreign contractors, design institutes, and foreign investors by emails and international direct call. These are simple inquiring to find whether the contacted samples willing to fill an e-survey form. Most of them know one of the writers personally, which provide the possibilities those respondents willing to take time to answer the e-survey questions. Five respondents were obtained by “snowball” method, i.e. the respondents were introduced by contacts’ contacts. In the e-survey form, it is promised that the respondents' names will be kept strictly confidential in the research report.

Attempted to have more responses of the e-survey, the writers had tried to send 14 cold emails to relevant foreign contractors and foreign investors who have projects in China according to their web information. Only one receipt has been obtained. However, this respondent did not fill the e-survey form in the end. These conform to Xu et al. (2004)'s the suggestion on data collection that little primary data are likely to be gathered without connections in Chinese construction industry.

The e-survey questions were designed to cover issues related to foreign contractors' strategic alliance based design-and-build delivery. The setting of questions has been based on the principle of concise, no leading, and having space for respondents to comment freely. For example, one of the questions on SWOT analysis of foreign contractors is "What are the foreign contractors' opportunities in China? Please indicate the importance of these factors by using the five-point scale (i.e. "1", "2", "3", "4", and "5" stand for "unimportant", "less important", "somewhat important", "important", and "very important" respectively". The listed factors are obtained from literature review and the pilot study. While it is convenience for respondents to choose, the questions remind or allow respondents to input other factors that are not provided in the list.

A total of 36 e-survey questionnaires were sent, where 22 of them have responded. The respondents cover areas of Beijing, Shanghai, and Xi'an. 11 respondents are from foreign contractors. Their occupations are regional managers, senior engineers, and project

managers. 5 respondents are from clients (foreign investors), in which 3 are country managers and 2 are division heads.

According to the pilot study, foreign contractors are unlikely to sustain their business without collaboration from design institutes (Xu et al. 2003). Design institutes are included in the e-survey samples. 6 respondents are from design institutes, in which 3 are directors and the other 3 are department heads. As some of respondents prefer to use Chinese to answer questions, the English version e-survey was translated to Chinese one.

Hong Kong, Macao, and Taiwan contractors are not included in this research, as they are in a separated category to foreign contractors according to National Bureau of Statistic (NBS 2002). As shown in Table 1, the nationalities of responded foreign contractors cover the USA, the UK, Japan, Norway, and Singapore. Three of the foreign contractors are listed in the top ten of ENR top 225 international contractors in 2002. According to NBS (2002), there were 16 foreign contractors registered in China in 2001. The regulation that allows foreign contractors to qualify as wholly foreign owned 'construction enterprises' has come into effect since Sep 2002 (MOC 2002). This e-survey was conducted in 2003. Although the accurate population of foreign contractors in 2003 is not available, it is reasonable to regard the representativeness of the surveyed foreign contractors is acceptable. Statistical analyses are applied on the responded survey questions using descriptive analysis (mean value analysis, standard deviation, and ranking). The e-survey results include a SWOT analysis of foreign contractors, design-build of foreign contractors, and strategic alliances between

foreign contractors and design institutes.

SWOT analysis of foreign contractors

In Art of War, a widely recognized classic military strategic book, Sun addressed that “know the enemy and know yourself, and you can fight a hundred battles with no danger of defeat” (Sun 1965). SWOT analysis technique helps foreign contractors to understand its internal and external positions. Based on e-survey to foreign contractors, design institutes, and clients (foreign investors), a SWOT analysis of foreign contractors has been conducted. The following numeric points are sorted according to the mean values of the factors in ascending order, e.g. as shown in below, “Good customer services attitude” is ranked as the most important characteristics of the foreign contractors’ strengths. Because mean values represent the trend of concentration.

Strengths

1. Good customer services attitude: Generally, foreign contractors have good reputation in customer services attitude which covers whole process of design and construction, from prior bidding to after sell services. Partly because foreign contractors come from market economy environment, where customer care is the key to success in the competitions. This result is very positive to foreign contractors. Because good customer services attitude will add credit to foreign contractors when they bid for construction projects.
2. Strong financial back-up: Sophisticated clients may require financial support from the

contractors. The budget for infrastructure construction in Beijing for the XXXIX Olympic Games 2008 is RMB 180 billion, in which RMB 90 billion is to be sourced from various financing channels such as BOT (China Business Newspaper 2002).

3. Strong design-and-build capacity: In the United Kingdom, significant numbers of both public and private sector projects are based on design-and-build delivery, which covers areas such as housing, industrial, retail, leisure, health, offices and utilities (Anumba and Evbuomwan 1997). In the United States of America, design-and-build delivery had been more accepted by public sector since 1992, after several years implementation in private sector (ASCE News 1992; Molenaar and Songer 1998). One reason for this increased use in design-and-build construction practice is to spur innovation in the build process. Innovation provides opportunity for improved quality and more cost-effective solutions to a client's construction needs (Songer et al. 1994).
4. Wide international business connections: This strength has twofold meanings in terms of foreign contractors' marketing. First, foreign contractors' international business contacts might provide business information or even directly recommend them to the potential clients (i.e. foreign investors in China). Second, Chinese clients might prefer foreign contractors if the latter could help the former' marketing outside China. For example, a Chinese industry park developer may like to engage a foreign contractor who can provide leads to attract foreign investors.
5. State-of-the-art technology: Chinese construction technology is not behind that in developed countries. It is not a difficulty task for local firms to design and construct technology intensive projects such as high rise buildings and flyovers. However, foreign

contractors' state-of-the-art technologies such as design and construct of nuclear power stations, intelligent buildings, and tunnels differentiate them from their local competitors.

Weaknesses

1. Higher operation cost compared to local competitors: One of Porter (1980)'s generic strategies for company to success is cost leadership in a competitive environment. The centre part of this strategy is to be less expensive than competitors in the whole range of a company's activities (Warszawski 1996). However, the survey shows that foreign contractors have higher operation cost compared to local competitors. The higher cost may be caused by expensive office overhead, high salaries of expatriates, and costly materials.
2. Lack of Guanxi (local connections): One may come across the term "Guanxi" often in the text books of Western university business schools. It is normally referred as business connections. However, Guanxi is disliked by the Chinese government, as it has been closely linked to nepotism and corruption. While not all Guanxi are illegal, Guanxi-based business practices favor those who have good local connections. Foreign contractors' Guanxi (or relationship) with relevant authorities, clients, subcontractors and suppliers influence their competitiveness in China.
3. Unfamiliarity with local design and construction codes: Chinese design and construction standards and codes were established in 1950's based on former Soviet Union construction system. After about 50 years modifications and improvements, the design and construction standards and codes in China are unique ones that are difficult for a

foreign professional to master in a given time frame.

4. Lack of local track record: Since foreign contractors are relatively new in China, it requires time for them to build up local track record. In many cases, local track record is one of the criteria for contractor selection of clients.

Opportunities

1. Foreign direct investment (FDI) projects: FDI offers a new market segment in China construction market. The amount of inward FDI for China has remained among the highest in the world. There was approximately a total of 4.4 Billion USD inwards FDI in 2001 (NBS 2002). Foreign contractors generally began overseas operations by accepting initial works from one's own government or from a compatriot multinational enterprise investing abroad. It is also consistent with current Chinese regulations that the areas of work of foreign contractors are constrained at foreign direct investment (FDI) projects and other foreign-funded projects (e.g. World Bank, Asia Development Bank and donor-specified projects etc) (Xu 2003).
2. Design-and-build projects: Design-and-build is a modest and emerging market segment (Xu 2003). Currently Chinese design-and-build providers are mainly active in the petrol and chemistry engineering sector. Foreign contractors may exert their design-and-build expertise to enter the market.
3. Build-operate-transfer (BOT) projects: The first build-operate-transfer (BOT) project in China, the Shajiao B Power Plant in Guangdong Province, had been transferred to the China side successfully in September 1999. The project, which was started in beginning

1989, had generated a total of 46.2 Billion KWH electricity by July 1999. More BOT projects in China are expected because of the need for infrastructures to serve the economic growth and the lack of government funding. However, some policy makers argue that the concession arrangements should not be used too often as it might compromise the country's sovereignty. Consequently, some proposed BOT projects were not able to proceed.

4. Diversifying into the real estate development: Real estate development investment has surged in recent years. It totaled RMB 622.8 billion from January to November 2002, which is 28.2% higher than that in 2001 (CEIN 2003). Some foreign contractors make their presence in China as real estate developers. They enjoy the tax reduction as foreign investors and have full control of the projects. However, this entry mode requires the foreign contractors to be familiar with real estate practice in China. Currently the maximum durations for land ownerships of the developers are fifty years for residential and commercial buildings and seventy years for industry. Previous housing allocation policy has been reformed and changed to the housing purchasing allowance policy. Mortgages are now offered by local banks to Chinese citizens.

Threats

1. Sino-foreign joint-ventured construction firms: Foreign contractors are allowed to establish international construction joint ventures with one or more Chinese partners in China by Law. There are two types of international joint ventures (IJVs) in terms of degree of equity involvement available in China: equity-based IJV and IJV with minimum equity

involvement (Xu et al. 2003). The top five risk factors in IJVs in East Asian countries has been identified as the client's cash flow problems, financial problems in partner's parent company, inconsistency in government policies, laws, and regulations, economic fluctuation, and poor relationship (incompetence of subcontractors/suppliers)(Li et al. 1999).

2. Chinese construction enterprises: The number of Chinese construction enterprises is 96,374 in 2001, in which 8,264 are State-owned Enterprises (SOEs) (NBS 2002). Through the process of accommodating and adapting to international best practice, Chinese construction enterprises has the opportunity to consolidate its domestic market and venture into new markets overseas (Xu and Wang 2001).
3. Chinese design institutes: Xu et al. (2004) studies current position of the Chinese design institutes. They tend to reinvent themselves to modern engineering consultants (e.g. multi- project delivery, better services mentality).
4. Chinese privately-owned contractors: The amount of privately-owned contractors is increasing every year. Many of which are small and medium enterprises (SMEs). The government has not given sufficient support to them, in terms of favorable tax rebate, loan consideration and cross border businesses. There are many restrictions on permits for such enterprises, such as to obtain and upgrade licenses, access bank loans, and undertake construction projects. However, they are competitive because they do not suffer burdens and free to make any decision to suit the market changes.

Proportions of Various Project Deliveries for Foreign Contractors

Figure 3 demonstrates the findings about the proportions of various project deliveries for the foreign contractors, clients (foreign investors), and design institutes respectively. Three respondents have ignored this question. They are from a foreign contractor, a client (foreign investor), and a design institute respectively.

Among the various project deliveries, design-build delivery receives the highest proportion for both foreign contractors and clients (foreign investors) in China, as shown in Figure 3.

Design-Build Delivery Using Strategic Alliances

The idea of design-build is that the design and the construction of a project are in the hands of one firm (Chappell and Powell-Smith 1993). As a typical design-build project, the client has requirements for his proposed project, and then the prequalified design-build contractors submit their tender documents including preliminary designs and cost estimates. Finally, based on the evaluation of the tenderers' submission, the project is awarded to a design-build contractor who might not be the lowest tender pricier.

Design is undertaken by either contractor's in-house designers or external consultant. Typically, design is processing in accordance with the client's brief and design-build contractor's own proposal which is accepted by the client.

In China, a foreign contractor often need to collaborate with design institute(s) for his design-and-build projects at least for a detailed design, provided the foreign contractor has possessed a license of engineering design which is likely to be costly. There are four forms of collaboration, mergers and acquisitions, international joint ventures, project-based collaboration, and strategic alliances (Xu et al. 2003). Among the four forms of collaboration, strategic alliances offer flexibility and long-term prospective for both foreign contractors and design institutes.

Importance of strategic alliance relationships between foreign contractors and design institutes

As displayed in table 2, 95.45% of the respondents believe that foreign contractors need to collaborate with Chinese design institutes for their design-and-build construction projects in China, while only 4.55% of the respondents (i.e. one respondent) disagree. A majority of the respondents, 72.73%, suggested that a strategic alliance with design institutes is essential for foreign contractors in China. On the other hand, 63.64% of the respondents indicated that a strategic alliance with foreign contractors for design institutes in China is essential.

Strategic Alliance and Real Option Theory

More than half of respondents, 57.14%, stated that the strategic alliance is the most effective form of collaboration, as shown in Table 3. Across the sample, 28.57% of the respondents indicated the project-based collaboration as the most effective one. 9.52% of respondents suggested international joint ventures. Only 4.76% (i.e. one respondent) of respondents

choose acquisitions. Note that one sample does not answer this question. In the e-survey form, the samples were advised to ignore any question that is not within their specialized knowledge or genuine experience.

Strategic alliances and international joint ventures have not been distinguished adequately in academy (Xu et al. 2003). To avoid the misunderstanding, strategic alliances have been further explained as (in the e-survey form) no contractual binding at corporate level.

Strategic alliances have been largely discussed in the context of international business over the past two decades (Büchel et al. 1998). However, there are underlying ambiguities regarding the definitions of strategic alliances, collaborations, and joint ventures in the research domains, partly because of some theoretical concepts (i.e. inter-firm cooperative, mutual-trust, synergistic strengths and complementarities) transcending these arrangements. Parker (1994) addressed that international alliances, partnership and consortia are generically called "joint venture". Simonin (1999) examined the role of knowledge ambiguity pertaining to the process of knowledge transfer in international strategic alliances. Without giving definition of strategic alliances, Simonin presumed that all forms of collaboration are of strategic alliances in the study. Chen (2002) defined strategic alliance as an inter-firm cooperative arrangement over a given economic space and time for the attainment of some strategic objectives. However, he treated joint venture as one of the types of strategic alliances in his research.

In the context of collaboration between foreign contractors and local partners in China, the writers contend that strategic alliances should be distinguished from mergers and acquisitions (M & As), international joint ventures (IJVs), and project-based collaboration, such that foreign contractors have a concrete basis to approach different forms of collaboration (Xu et al. 2003). In this research, strategic alliances are defined as voluntary long-term inter-firm cooperative arrangements with flexibility for participating parties. The flexibility enables the participating parties to have right rather than obligation to defer, abandon, contract, and initiate the decisions regarding the collaboration, as response to the changes of the market.

Unlike rigid arrangements in M & As, IJVs, and project-based collaboration, strategic alliance arrangements offer flexibility to the parties involved. It is said that the only thing unchanged is the change. In the context of international collaboration, a viable strategy to cope with unpredictable market is to reserve as much options as possible at minimum costs.

A foreign contractor could form a strategic alliance with a local partner in one or more cities in China from business development, tendering, design, and construction to handing over of the project to the client. Under the strategic alliance arrangements, separate contracts between the foreign contractors and the local partners can be incorporated for different stages of individual projects, taking into account the unique legal conditions in China.

Strategic alliances provide participating parties an effective channel to utilize external resources. However, there are costs involved in the strategic alliance arrangements. These

could consist of the costs for trying to guard against opportunism, creating a perception of the strategic alliances, resources for coordination among participating parties, and company brands.

Critical Success Factors of Strategic Alliances between Foreign Contractors and Design Institutes

Critical success factors have significant impact on the success of the strategic alliances between foreign contractors and design institutes. As shown in Table 4, respondents were required to rank the factors. Three respondents have ignored this question. Mutual-trust receives the 1st rank. Under strategic alliance arrangement, the collaborated parties have right but no obligation to trust each other. However, if mutual-trust can be realized, the strategic alliance is likely to be successful. Trust normally comes from both the reputation (intangible asset) of the trustee organization and its capacity (tangible asset) of its commitment adherence.

The factor of synergistic strengths and complementarities is ranked as the 2nd one. Synergistic strengths and complementarities spell out that the collaboration should be mutual-benefited. The strategic alliances between highly competitive foreign contractors and design institutes are considered as synergistic strengths. Synergistic strengths and complementarities enable collaborated parties utilized external resource effectively. Therefore, strategic alliance arrangements reduce the cost caused by overlapped resources from the parties. The goals of collaborated parties could be congruent or incongruent but dependent on

one another to achieve. Synergistic strengths and complementarities emphasize that collaborated parties are able to provide values to each other as well as to value added services to the clients.

The survey shows that market demand for the services provided by foreign contractor – design institute collaboration is strongly related to the success of the collaboration. It is ranked 3rd. Buyers are the key stakeholders of the firms. They influence the outcome of strategic alliances. This finding can be interpreted as that the collaboration is business oriented. If the market demand reduced or disappeared, there is no point to maintain the strategic alliances.

Flexibility for both parties receives the 4th rank of the success factors. With the flexibility, collaborated parties can be not only quick to close external capacity as prices fall but also quickly to reopen external capacity as prices rise. Unlike IJVs, strategic alliances should leave room for collaborated parties to negotiate. This may avoid confrontation caused by conflicts of parties' interests. External market is changing rapidly. The flexibility relationships offer active position for both parties in response to the market turbulence.

Staff from both parties understand the strategic alliance agreement is ranked as the 5th one. Often it is easy for senior and middle managements to be familiar to the agreement. To facilitate the collaboration, all levels of staffs from both parties should understand the strategic alliance agreement.

Both minimum change of top managers from both parties and More overseas-trained local professionals and managers are ranked as the 6th success factor. Although the execution of a strategic plan should not only rely on particular managers, stability of top managers is one of the conditions for a consistency of the company policies.

More overseas-trained local professionals and managers are required to facilitate the strategic alliances. Institutional and cultural differences may cause communication breakdown among expatriates, local staffs, design institutes, and local authorities. Overseas-trained local professionals and managers could effectively link expatriates and local staffs from all involved parties whenever the communication problems arose.

With 7th rank, local government support would enhance the strategic alliances. Visible or invisible, the local government in any country show favor to their local companies, even though they are WTO member countries. To collaborate with local design institutes at the form of strategic alliances can help foreign contractors to overcome this disadvantage. At the arrangement of strategic alliances, the collaborated parties contribute to local economy through tax contribution, offering more employment opportunities, model effect to other local contractors, and stimulating quality services from local supply chain. This in turn creates harmony between foreign contractors and local governments and communities in China.

It is important to note that Legal contract for individual projects is ranked as the 8th one. As

suggested by the definition of strategic alliances, there is no legal binding for the parties involved in strategic alliance arrangements at corporate level. However, legal contract is preferred at project level. Because it is costly to detect possible bad faith parties from good ones. Given the current construction practice in China, legal contract is needed to define the risks and responsibilities of the parties involved at project level.

Less dispute than other forms of collaboration is expected if the strategic alliances are to be success. This factor receives 9th. Conflicts of interests may cause dispute. Although dispute could never be eliminated in any form of collaboration, many disputes can be prevented or reduced.

Chinese central government support would provide priorities for the strategic alliances. It is ranked 10th. Central government support may influence the bargaining power of the strategic alliances by using government controlled resources such as approval/disapproval of licenses, providing currency conversions, or repatriation of profits. However, it rarely be given to normal construction business.

Less expatriates to be involved and more expatriates to be involved are contradicted. They are ranked as 12th and 13th respectively. Further, they are mean values are very close, 1.89 and 1.84. It can be concluded that the amount of expatriates to be involved is not critical to the success of strategic alliances.

Design Institute Selection for Strategic Alliances

Most of the design institutes are willing to collaborate with foreign contractors (Xu et al 2004). Medium-sized, state-owned, and large-sized design institutes are rated as 1st, 2nd, and 3rd suitable strategic alliance partners for foreign contractors, as shown in Table 5. Most of design institutes were state-owned, and are under ownership restructuring. The grading criteria of design institutes can be referred in the Appendix.

The large, medium, and small sized design institutes are equivalent to Grade A, B, and C respectively. As shown in Figure 4, there were 1,707 Grade A, 2,521 Grade B, 4,670 Grade C, and 883 Grade D. The number of Grade D design institute is to be reduced to zero gradually, according to current reforming schema.

As shown in Figure 5, there were 7,212 State-owned design institutes, 836 Collective design institutes (towns and village enterprises), and 3,447 joint stock design institutes and private-owned design institutes in 2002 (Department of Quality and Safety Supervision and Sector Development 2003). The ownerships of joint stock design institutes are shared by major designers, individual investors, firms, and governments. It was taken form in 1993 and fully endorsed in 1999. More information and analysis of design institutes can be referred at Xu et al. (2004).

A large-sized design institute might have some 200 architects and generate RMB 1.1 Billion a year. Usually, it could have collaborated with more than one foreign contractor. To this end, foreign contractors' needs might be better understood by a large-sized design institute.

However, they tend to ask higher price for the collaborated projects offered by foreign contractors.

Design institute with above average profit margin is ranked 4th. Same sized design institutes might not be in same profitability. With revenue of RMB 93.1 Billion and profit of RMB10.07 Billion, the average revenue per head of the Chinese design institutes was RMB120, 230 in 2002 (Department of Quality and Safety Supervision and Sector Development 2003). The purpose of setting this option is to test the respondents' view about profitability of a design institute regardless of other features of a design institute.

Design institute with average profit margin receives 5th. The survey shows that the existing profitability of design institutes is a criterion of foreign contractors' partner selection.

Private-owned design institute is ranked 6th. For historical reason, this kind of design institutes has been small-sized, although the total output of the whole private sector has surpassed that of the state-own firms since 1989. Normally, they are profitable and owned by registered architects or engineers. Some of them have still maintained administrative links with state-owned design institutes.

Design institute with below average profit margin has received 7th rank. No respondent has selected small-sized design institute.

Conclusions

The paper offers a SWOT analysis for foreign contractors in China. The e-survey results provide evidence for foreign contractors to understand their position in the Chinese construction market. Targeting on FDI and using design-and-build delivery are suggested as foreign contractors' opportunities in China.

Among the various project deliveries, design-and-build delivery receives the highest proportions for both foreign contractors and clients (foreign investors) in China. Unlike design-and-build in Western countries, foreign contractors' design-and-build strategy needs to incorporate with design institutes and FDI. Foreign contractor-design institute strategic alliances have been identified as the most appropriate type of collaboration for foreign contractors, while project-based collaboration is second to strategic alliances.

The paper first uses real option theory to analyse the strategic alliances. The underlying philosophy of strategic alliances is to reserve the right rather than the obligation to utilise the external resources or supply resources to collaborated parties. The arranged flexibility of the strategic alliances enables foreign contractors to exploit the opportunities without large amount of equity commitment.

The critical success factors of strategic alliances between foreign contractors and design institutes shed light to international collaboration theories. Mutual-trust , synergistic strengths

and complementarities, market demand for the services, flexibility for both parties, and minimum change of top managers have been ranked as top five critical success factors for strategic alliances between foreign contractors and design institutes.

A general guideline of design institute selection for foreign contractors' strategic alliances has been provided. The selection is based on the types, sizes, and profitability of the design institutes. Medium-sized, state-owned, and large-sized design institutes are rated as 1st, 2nd, and 3rd suitable strategic partners for foreign contractors respectively.

The framework of design-and-build delivery using strategic alliances developed in this research contributes new approach for design-and-build delivery as well as international construction collaboration. Moreover, the results provide in this research is to directly offer a valuable reference to the practice of foreign contractors, design institutes, and China construction policy makers.

Acknowledgments

The writers deeply appreciate the directors and managers from foreign contractors, design institutes, and clients (foreign investors) who have kindly filled the e-survey form.

Reference

- Anumba, C. J., and Evbuomwan, N. F. O. (1997). "Concurrent engineering in design-build projects." *Construction Management and Economic*, 15(3), 271-281.
- ASCE News. (1992). "CE summitters offers views on problems troubling the profession." *Civil Engineering*, ASCE, 62(8), 66-67.
- Badger, W. W. and Mulligan, D. E. (1995). "Rational and benefits associated with international alliances." *Journal of Construction Engineering and Management*, ASCE, 121 (1), 100-111.
- Büchel, B., Prange, C. , Probst, G., and Ruling, C.(1998). *International Joint Venture Management: Learning to Cooperate and Cooperating to Learn*, John Wiley & Sons (Asia) Pte Ltd, Singapore.
- Chappell, D. and Powell-Smith, V. (1993). *The JCT Design and Build Contract*, Blackwell Scientific Publications.
- Chen, C. (2002). "The effects of environment and partner characteristic on the choice of alliance forms." *International Journal of Project Management*, 21(2), 115-124.
- China Business Newspaper. (2002). *Who water the thirsty of 90 billion yuan for Beijing road construction, investors rush in with unknown outcome*. 1441, July 11, 2002
- China Economic Information Network. (CEIN) (2003). *Total Investment on Fixed Asset*. < <http://www1.cei.gov.cn/cedb/> > (March 1 2003).
- Flanagan, R. and Li, S. R.(1997). *International Construction: a perspective of China*. the Chartered Institute of Building, UK.
- Li, B. Tiong, R. L. K, Wong, W. F. and Chew, D. A. (1999). "Risk management in international construction joint ventures." *Journal of Construction Engineering and*

- Management*, ASCE,125(4), 227-291.
- Luo, J. (2001). "Assessing management and performance of Sino-foreign construction joint ventures." *Construction Management and Economics*, 19(1), 109-117.
- Mayo, R. E. and Liu, G. (1993). "Reform agenda of Chinese construction industry." *Journal of Construction Engineering and Management*, ASCE, 121(1), 80-85.
- Meng, X. H. (2002). "Guarantees for contractor's performance and owner's payment in China." *Journal of Construction Engineering and Management*, ASCE, 128(3), 232-237.
- Ministry of Construction (MOC). (2001). *Grading Standards of Engineering Design Licenses*, Ministry of Construction, Jan 20, 2001.
- Ministry of Construction (MOC). (2002). *Regulation on Administration of Foreign-Invested Construction Enterprises*, the Decree No. 113 Joint Ordinance of Ministry of Construction and Ministry of Foreign Trade and Economics, 29 Sep 2002, Beijing.
- Molenaar, K. R. and Songer, A.D. (1998). "Model for public sector design-build project selection." *Journal of Construction Engineering and Management*, ASCE, 124(6), 467-479.
- National Statistic Bureau (NBS) (2002). *China Statistical Year Book (2001)*, National Statistic Bureau, Beijing.
- Parker, N. (1994). "Managing the Search for partners." *Collaboration Management: New Project and Partnering Techniques*, Edited by Shaughnessy, John Wiley & Sons Ltd, 35-54.

- Pheng, L. S. and Leong, H. Y. (2000). "Cross-cultural project management for international construction in China." *International Journal of Project Management*, 18, 307-316.
- Porter, M. E. (1980). *The Competitive Strategy*. The Free Press, New York, N. Y.
- Rugman, A. M. and Hodgetts, R. M. (1995). *International Business: A Strategic Management Approach*, McGRAW-HILL, INC.
- Shen, L. Y. and Song, W. G.(1998). "Competitive tendering practice in Chinese construction." *Journal of Construction Engineering and Management*, 124(2), 155-161.
- Shen, L. Y., Wu, G. W. C. and Ng, C. S. K.(2001). "Risk assessment for construction joint ventures in China." *Journal of Construction Engineering and Management*, ASCE, 127(1), 76-81.
- Simonin, B. L. (1999). "Transfer of marketing know-how in international strategic alliances: an empirical investigation of the role and antecedents of knowledge." *Journal of International Business Studies*, 30(3), 463-490.
- Songer, A.D., Ibb C. W., and Napier T. R. (1994). "Process model for public sector design-build planning." *Journal of Construction Engineering and Management*, ASCE, 120(4), 857-874.
- Sun Zi. (1963). *Art of War*. Translated and with an introduction by Samuel B. Griffith ; with a foreword by B.H. Liddell Hart, Oxford: Clarendon P.
- The Construction Law of the People's Republic of China* (1997). China Construction Industry Publication House, Beijing (in Chinese).
- The Department of Quality and Safety Supervision and Sector Development. (2003). *Annual Report of National Investigating and Design Enterprises for Year 2002*. No.23 The

Department of Quality and Safety Supervision and Sector Development, Ministry of Construction, 8 July 2003.

Turner, D.F. (1995). *Design and Build Contract Practice*, Second Edition, Longman Scientific & Technical.

Vanhonacker, W. (1997). "Entering China: An unconventional approach." *Harvard Business Review*, 75, March-April 1997 Issue, 130-140.

Wang, S. Q., Tiong, R. L. K., Ting, S. K., Chew, D., Ashley, D.(1998). "Evaluation and competitive tendering of BOT power plant project in China." *Journal of Construction Engineering and Management*, ASCE, 124(4), 333-341.

Wang, Y. H. (2000). "Coordination issues in Chinese large building projects." *Journal of Management in Engineering*, ASCE, 16(6), 54-61.

Warszawski, A. (1996). "Strategic planning in construction companies." *Journal of Construction Engineering and Management*, ASCE, 122 (2), 133-140.

Xu, T. (2003). "Foreign contractors' design-and-build model in China." In *Proceedings of the 2nd International Conference On Innovation In Architecture, Engineering and Construction*, Millpress, Rotterdam, The Netherlands, 683-691.

Xu, T. and Wang, Y. Q. (2001). "The international linking-up of China's construction industry after its WTO entrance." *Journal of Xi'an Jiaotong University(social Sciences)*. 21(1), 22-29.

Xu, T., Bower, D. A., and Smith, N. J. (2003). "Forms of collaboration for foreign contractors in China." *Proceedings of the Nineteenth Annual Conference of ARCOM*, University of Brighton, Reading: ARCOM, Vol. 2. 777-787.

- Xu, T., Smith, N. J., Bower, D. A., and Chew, A. S. D. (2004). "Development strategies of Chinese design institutes." *Journal of Management in Engineering*, ASCE, 20(2), 62-69.
- Yang, M. L. (1997). "Project management practices in Pudong, a new economic development area of Shanghai, China." *International Journal of Project Management*, 15(5), 313-319.
- Ye, S. and Tiong, R. K. L. (2000). "Government support and risk-return trade-off in China's BOT power projects." *Journal of Engineering, Construction and Architectural Management*, 7(4), 412-422.

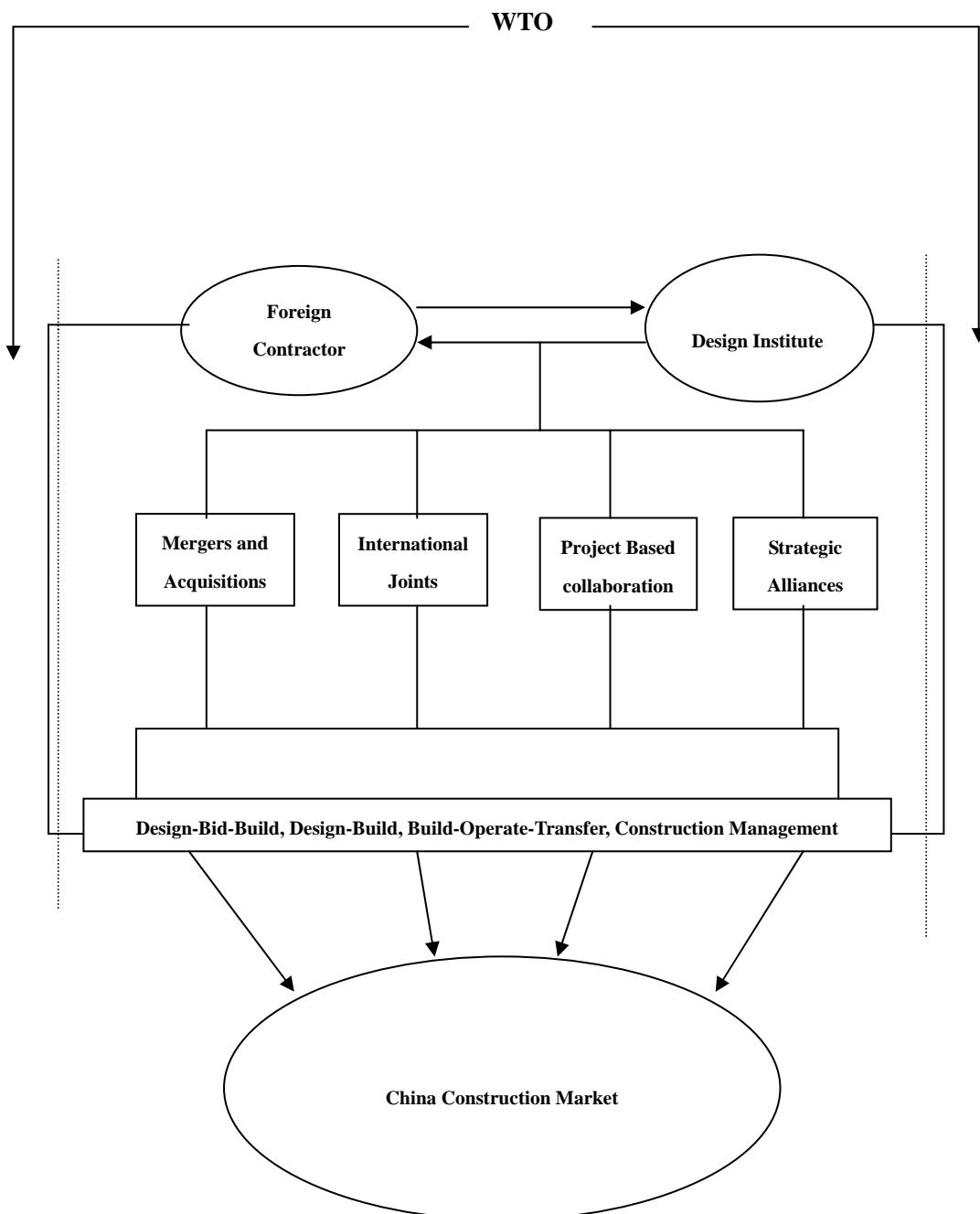


Figure 1. The Pattern of Foreign Contractors' Development Formations in China

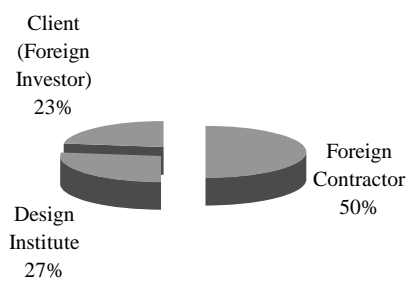


Figure 2 The Proportion of Types of Respondents

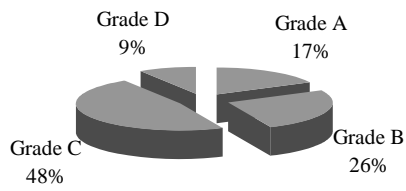
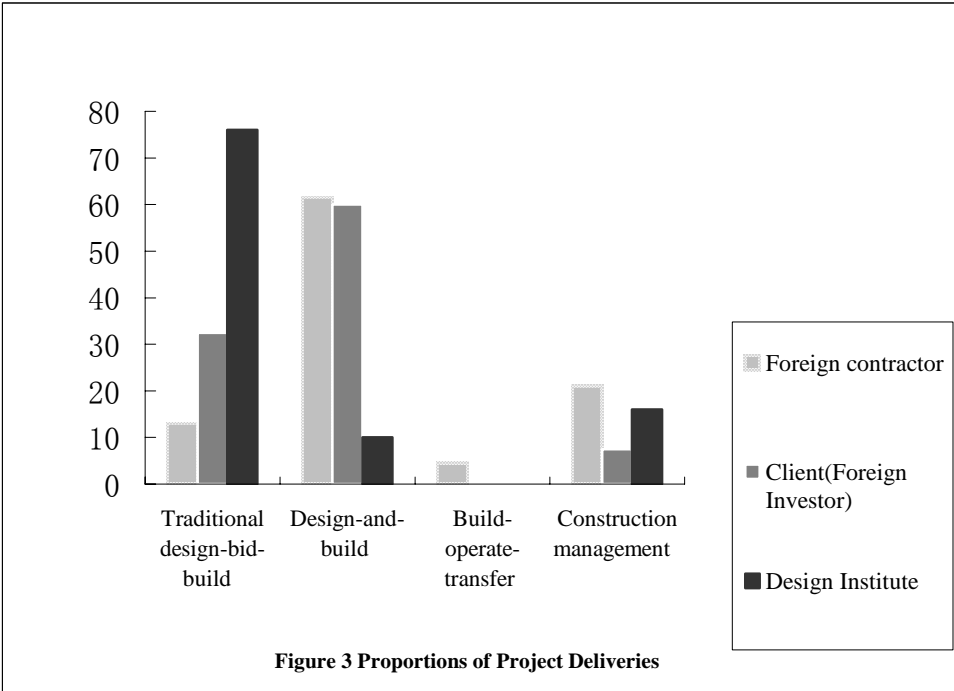


Figure 4 Design Institute Grades 2002 (Source: The Department of Quality and Safety Supervision and Sector Development)

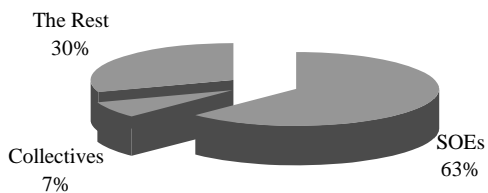


Figure 5 Types of Design Institutes 2002(Source: Department of Quality and Safety Supervision and Sector Development 2003)

Table 1 Profiles of Foreign Contractors Responded by Nationality

Country	Number of Respondents
USA	4
UK	1
Japan	2
Norway	1
Singapore	3
Total	11

Table 2 Importance of strategic alliance relationships between foreign contractors and design institutes

Questions	Answer	Number of	Percentage
-----------	--------	-----------	------------

(1)	(2)	Respondents (3)	(%) (4)
Do you think foreign contractors need to collaborate with Chinese design institutes for their design-and-build construction projects in China	Yes	21	95.45
	No	1	4.55
Is a strategic alliance with design institutes essential for foreign contractors in China?	Yes	16	72.73
	No	6	27.27
Is a strategic alliance with foreign contractors essential for design institutes in China?	Yes	14	63.64
	No	8	36.36

Table 3 Forms of collaboration

Question (1)	Forms of Collaboration (2)	Percentage (%) (3)	Rank (4)
What is the most effective collaboration form that a foreign contractor can pursue with a Chinese design institute?	strategic alliance	57.14	1
	project-based collaboration	28.57	2
	international joint venture	9.52	3
	acquisition	4.76	4

Table 4 Critical success factors of strategic alliances between foreign contractors and design institutes

Factor (1)	Mean (2)	Standard Deviation (3)	Rank (4)
Mutual-trust	4.47	0.61	1
Synergistic strengths and complementarities	4.37	0.68	2
Market demand for the services	3.95	1.08	3
Flexibility for both parties	3.53	0.90	4
Staff from both parties understand the strategic alliance agreement	3.47	1.02	5
More overseas-trained local professionals and managers	3.42	1.22	6
Minimum change of top managers from both parties	3.42	1.26	6
Local government support	3.32	1.16	7
Legal contract for individual projects	3.26	1.33	8
Less dispute than other forms of collaboration	3.11	1.05	9
Chinese central government support	2.89	1.05	10
More expatriates to be involved	1.89	1.05	11
Less expatriates to be involved	1.84	1.21	12

Table 5 Selection of design institutes for strategic alliances

Type of Design Institutes (1)	Mean (2)	Standard Deviation (3)	Rank (4)
Medium-sized design institute	0.45	0.51	1
State-owned design institute	0.41	0.50	2
Large-sized design institute	0.38	0.50	3
Design institute with above average profit margin	0.32	0.48	4
Design institute with average profit margin	0.27	0.46	5
Private-owned design institute	0.23	0.43	6
Design institute with below average profit margin	0.05	0.21	7
Small-sized design institute	0.00	0.00	8

Appendix Grading Criteria of Design Institutes (Source: MOC 2001)

Criteria	Grade		
	A	B	C
Track Record and Financial Standing	<ol style="list-style-type: none"> 1, Independent legal person, more than 15 years design experience, with good reputation in the sector; 2, Independent undertook more than 3 large projects which have been accepted by the clients, with good quality and profitability; 3, Good social responsibility and financial strength, with no less than RMB 6 Millions as registered capital. 	<ol style="list-style-type: none"> 1, Independent legal person, more than 10 years design experience; 2, Independent undertook more than 3 medium scale projects which have been accepted by the clients, with fair quality and profitability; 3, Fair social responsibility and financial capacity, with no less than RMB 2 Million as registered capital. 	<ol style="list-style-type: none"> 1, Independent legal person, more than 6 years design experience; 2, Independent undertook more than 3 small scale projects which have been accepted by the clients, with fair quality and profitability; 3, Have social responsibility and necessary financial capacity, with no less than RMB 0.8 Million as registered capital.
Professionals	<ol style="list-style-type: none"> 1, More than 80 professionals and technicians in all necessary disciplines, having capacity to undertake the design of 2 large scale projects in the same time; 2, The engineer in charge shall be a senior engineer with more than 12 years design experience and have been in charged of the design or participated the design of more than 2 large scale projects; 3, More than 10 senior engineers who have been in charged of design in their respectively disciplines no less than 2 large scale projects, more than 2 Grade 1 registered architects and 4 Grade 1 registered structural engineers, more than 20 senior engineers who have 	<ol style="list-style-type: none"> 1, More than 30 professionals and technicians in all necessary disciplines, having capacity to undertake the design of 2 medium scale projects in the same time; 2, The engineer in charge shall be a senior engineer with more than 10 years design experience and have been in charged of the design or participated the design of more than 2 medium scale projects; 3, More than 5 senior engineers who have been in charged of design in their respective disciplines in no less than 2 medium scale projects, more than 1 Grade 1 registered architect and 2 Grade 2 registered structural engineers, more than 10 senior engineers who have 	<ol style="list-style-type: none"> 1, More than 15 professionals and technicians in all necessary disciplines, having capacity to undertake the design of 2 small scale projects in the same time; 2, The engineer in charge shall be a senior engineer with more than 10 years design experience and have been in charged of the design or participated the design of more than 2 small scale projects; 3, More than 4 senior engineers who have been in charged of design in their respective disciplines in no less than 2 small scale projects, more than 2 Grade 2 registered architect and 2 Grade 2 registered structural engineers, more

	<p>been in charged of or participated the design of more than 2 large scale institutional or commercial projects in their respective disciplines;</p> <p>4, Meeting the requirement of proportion of sector leading discipline and other disciplines.</p>	<p>been in charged of or participated the design of more than 2 medium scale institutional or commercial projects in their respective disciplines;</p> <p>4, Meeting the requirement of proportion of sector leading discipline and other disciplines.</p>	<p>than 5 senior engineers who have been in charged of or participated the design of more than 2 small scale institutional or commercial projects in their respective disciplines;</p> <p>4. Meeting the requirement of proportion of sector leading discipline and other disciplines.</p>
Technology	<p>1, Own at least one engineering potent, or technology, or software, meeting the basic requirement of domestic advanced computer application , and prominent application in design;</p> <p>2, Able to utilize potent, special technology, and software to undertake design independently;</p> <p>3, Able to collaborate with foreign firms for design or independent design in foreign countries, having capacity in project management;</p>	<p>1. Able to design by using advanced technology independently;</p> <p>2. Having capacity in project management;</p> <p>3 , Able to make computer application.</p>	<p>1, Able to design by using advanced technology;</p> <p>2, Having certain capacity in project management.</p>
Facility and Application of Equipment	<p>1, Having necessary advanced equipment which meet grade 1 criteria set by relevant authorities;</p> <p>2, 100% drafting by CAD, 90% feasibility studies and conceptual design by CAD, 90% conceptual design selection by CAD, computer management documentation for files and drawings, gradually realizing computer management for design projects through engineering software, having fair</p>	<p>1, Having necessary equipment which meet Grade 2 criteria set by relevant authorities;</p> <p>2, 100% drafting by CAD, 80% feasibility studies and conceptual design by CAD, 80% conceptual design selection by CAD, computer management documentation for files and drawings, able to use computer to design and design management, having fair established computer network management;</p>	<p>1, Having necessary equipment,50% drafting by CAD, computer management documentation for files and drawings, able to use computer to design and design management;</p> <p>2, Having permanent offices, each professional shall have average no less than 10 m² office area.</p>

	<p>established computer network management;</p> <p>3, Having permanent offices, each professional shall have average no less than 12 m² office area.</p>	<p>3, Having permanent offices, each professional shall have average no less than 10 m² office area.</p>	
Management	<p>1, Established management system centered by design projects, with effective quality, progress, and cost control;</p> <p>2, Established organizational structure, standard system, quality system, and able to use dynamic management, obtained ISO 9001 certificate.</p>	<p>1, Having management system centered by design projects, with quality, progress, and cost control;</p> <p>2, Having effective quality management system and technology, operation, human resources, accounting, documentation management system.</p>	<p>1, Having management system centered by design projects;</p> <p>2, Having effective quality management system and technology, operation, human resources, accounting, documentation management system.</p>
Achievements and Awards	<p>1, More than 3 awards in recent 4 years for provincial or above excellent engineering design, excellent software, or excellent standard design;</p> <p>2, Edited more than 2 or participated editing more than 3 national, sectoral, or local engineering construction standards, codes, price index, or standard design.</p>	<p>1, Participated editing of national, sectoral, or local engineering construction standards, codes, price index, or standard design.</p>	NA