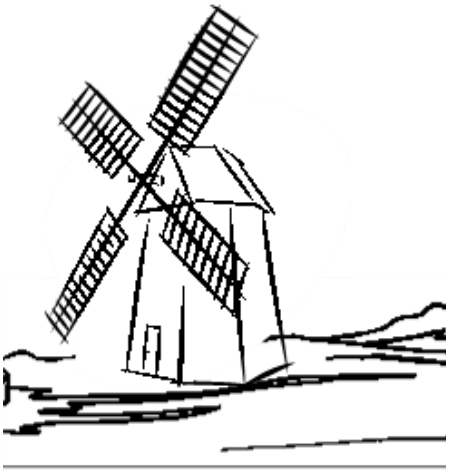

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A Proposed Framework for Evaluating the International Construction Performance of AEC Enterprises

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A PROPOSED FRAMEWORK FOR EVALUATING THE INTERNATIONAL CONSTRUCTION PERFORMANCE OF AEC ENTERPRISES

Zhi-Gang Jin[1] and Fei Deng[2]

ABSTRACT

Internationalization of architectural, engineering and construction (AEC) enterprises has gained significant interests as the global construction market has been integrated into a more competitive and turbulent business environment, whilst there is no consensus on how to measure the international performance of AEC firms as a result of the complicated and multifaceted nature of business performance and internationalization. The aim of this paper is to propose a conceptual framework for evaluating the international construction performance of AEC firms, which is based on a comprehensive literature review and revised from the Balanced Scorecard (BSC) by considering the unique characteristic of the construction industry and international construction markets, e.g., satisfying stakeholders, integrating supply and business chain, and consideration of project management capabilities. Further, a questionnaire survey is conducted to investigate the quantitative importance of proposed performance measures and uncover the cause-and-effect relationship among these measures, which is the premise of the BSC. Additionally, a case study of a large international AEC firm in China is adopted to validate the robustness and usefulness of the proposed framework. It is found that the framework is effective to identify the weak areas of AEC firms by applying a benchmarking approach, indicating the applicability of this framework for AEC enterprises to monitor their performance and adjust related strategies for better internationalization.

KEYWORDS: construction firm, internationalization, performance measurement, AEC enterprises, China

INTRODUCTION

The measurement of performance is critical to senior management executives who are responsible for adopting and implementing appropriate strategies. The principal reason is explictly explained as: "When you can measure what you are speaking about, and express it in numbers, you know something about it…[otherwise] your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in thought advanced to the stage of science. (Lord Kelvin, 1824-1907)" (c.f., Fisher 1990; Neely et al. 1995; Tangen 2004)

Performance measurement (PM) revolution has spread to the construction industry, and some industry reports (e.g., Egan 1998; Latham 1994) undoubtedly pushed the PM philosophy into a new stage, reflected by the situation that many countries have initiated various performance benchmarking programs, e.g., UK (Cbpp 2000), US (Lee et al. 2005),

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Canada-Benchmarking System (Rankin et al. 2008), Netherlands (Bakens et al. 2005), Portugal (Horta et al. 2010), and Brazil (Costa et al. 2006). Benchmarking approach is widespread in the construction industry as it is an effective tool to monitor the averaged performance of the whole industry, and more importantly, benchmarking thinking in construction, specifically the performance of projects, can be applied to compare the performance of individual organizations with the average level of the industry. Besides the importance for providing third-party benchmarks for the industry, these benchmarking programs play an essential role in fostering quantitative measurement culture and popularizing common performance measurement and benchmarking practices. This role would be more critical to these AEC enterprises who are striving in the international construction market as they usually face turbulent business environment and strong competitors worldwide. Understanding the nature of the international construction performance will be useful for international AEC firms to evaluate their positions and revisit the firm strategy. Thus, the aim of this research is to establish a robust framework that contains a set of detailed indicators for evaluating the international construction performance of AEC enterprises. By proposing a robust and practical framework for evaluating the international construction performance of AEC enterprises, the research would contribute to theoretical development of international construction performance and the implementation of performance measurement in practice, especially in evaluating international performance, enabling self-assessment, comparing strengths and weaknesses, attaining firm capabilities, and formulating related internationalization strategies.

After reviewing the literature of international construction and performance measurement in construction, this paper briefly presents some research methods adopted in this research (e.g., questionnaire survey), then the development of the framework for evaluating the international construction performance is discussed by following the case study of a Chinese AEC enterprise, and finally main conclusions, practical implications, and limitations are discussed for future research.

LITERATURE REVIEW

Understanding the International Construction

The issue of the international construction performance has drawn much attention in the construction literature over the last two decades (e.g., Best and Langston 2006; Edkins and Winch 1999; Ling and Kwok 2007; Low and Jiang 2003,2004; Ofori 2003). Porter's diamond concept is one of the competitiveness theoretical framework widely adopted by scholars (e.g., Dunning 1992; Ofori 1994) as a starting point to analyse the international construction competitiveness or performance. Porter's theory of firm's competitiveness is characterised by industrial organisation view of competitive advantage (Flanagan et al. 2007). Porter (1991) developed a diamond framework, and identified four determinants to gain and sustain competitive advantage of the firm: factor conditions; demand conditions; related and supporting industries; and context for firm strategy and rivalry. In Porter's view, two exogenous factors, government and chance influence the functioning of these four major determinants. By discussing the framework for evaluating the international construction performance, Ofori (2003) raised an interesting question in regard to the

features that a construction enterprise must possess in order to succeed in the international arena. To improve the international competitiveness, Ofori (2003) argued the importance of firm-specific advantages, which include the firm's track record, corporate knowledge, communication structures, resources and risk management skills. Similarly, Cuervo and Low (2003) and Ling et al. (2005) also stated that good reputation and track records are significant for enterprises to compete on the quality of services/products, and to be successful in international markets. Ling et al. (2005) further argued that an enterprise that strives to attain international competitiveness should provide excellent product and service quality, and high quality professional and technical staff. Therefore, strong financial resources and supports, superior technological skills, and efficient and effective management and strategic planning are critical for construction firms to be successful in the international construction market. Some other researches tend to understand the success factors for international AEC firms, e.g., The International Construction Task Force [ICTF (1993)], United Nations Centre for Transnational Corporations [UNCTC (1989)], The Market Analysis Task Force [MATF (1991)], Flanagan et al. (2007), and Ling and Kwok (2007) (others including Cuervo and Low 2003; Jennings and Holt 1998; Kong 1994; Ling et al. 2005; Pietroforte 1996; Seymour 1987; Zhao and Shen 2008). Determinants of success in the international construction market are shown in Table 1[3] .

Evaluating the Business Performance of AEC Enterprises

Performance measurement of AEC firms is much less focused than that of construction projects, but there are some researches that focus upon how to evaluate the performance of AEC firms as both internal and continuous management and one-time evaluation. For example, some researchers in construction tried to understand the performance of construction firms by designing conceptual frameworks, such as Kagioulou et al. (2001), Love and Holt (2000), and Bassioni et al. (2005). Kaigioulou et al. (2001) design a conceptual framework by adding two dimensions—project and supplier perspective—into the BSC to make it more appropriate for the situation of the construction industry, where project performance and suppliers performance are crucial to the overall performance of construction firms. As the project management team is usually temporary, they further argue that the perspective of innovation and learning is problematic in the construction industry. A more complex and comprehensive framework is designed by Bassioni et al. (2005), who build it upon the principles of BSC and European Foundation for Quality Management (EFQM), and empirical weights of these dimensions are presented (Bassioni et al. 2008). Although interviews show that the framework is practical to some extent, successful application is doubted because of its complexity.

Some other researchers assume that these frameworks can be applied directly in the construction industry and used as a management technique both in research and in practice, such as Yu et al. (2007), Luu et al. (2008), Arditi and Lee (2003), and Beatham et al. (2005). Yu et al. (2007) designed 12 benchmarking measures under four perspectives of BSC, indirectly showing that strategy alignment is not the predominant issue for the application of BSC. This contradicts with the premise of BSC. A more specific approach is adopted by Luu et al. (2008), who apply BSC to design PMs within a case study

[3] All tables are presented in the Appendix.

construction firm, and firm strategies are deployed to design PMs. Besides the application of those popular frameworks, some operation models are adopted to benchmark the overall performance of construction firms, e.g., Data Envelope Analysis (El-Mashaleh et al. 2007; Horta et al. 2010). Simple measures are adopted to make the benchmarking process more applicable. Although progress has been made in the application of PM frameworks, there are significant challenges at the planning, deployment and assessment and review stages (Robinson et al. 2005a). As applications of key performance indicators (KPIs), BSC, and EFQM have been adopted in the construction industry for a long period, barriers and problems during the application process should be further researched (Bassioni et al. 2004).

Appraising the BSC Approach

The BSC, first developed by Kaplan and Norton in 1992, is described as one of the most influential business ideas of the past 75 years by the Harvard Business Review and is estimated to be used by 40% of the Fortune 1,000 companies at the end of 2001(Marr and Schiuma 2003). Kaplan and Norton's works (Kaplan and Norton 1992) firstly argue that traditional financial measures are 'out of step with the skills and competencies companies are seeking to master today' (Kaplan and Norton, 1992, p.75). Then they developed a BSC approach, which contains four perspectives:

(1) Financial measures: how do we look to shareholders?
(2) Customer satisfaction: how do customers see us?
(3) Internal process: what must we excel at?
(4) Organizations' innovation and learning: can we continue to improve and create value?

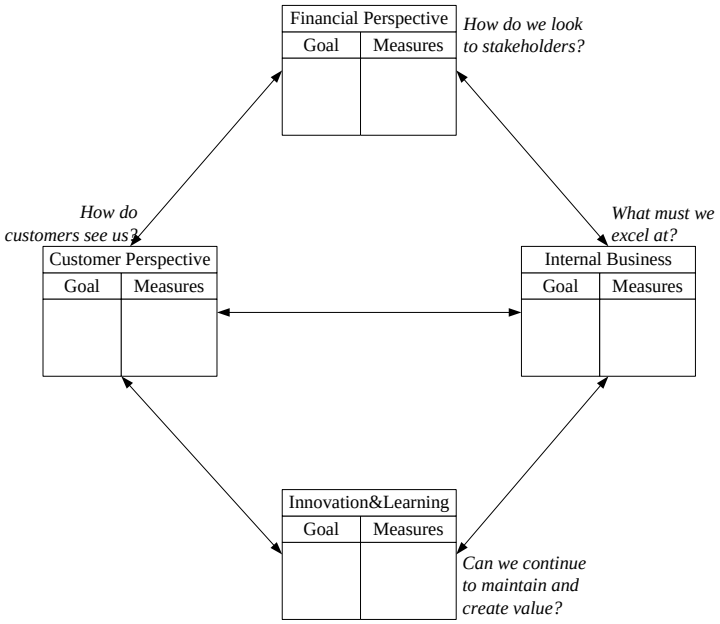

Figure 1: The Framework of the Balanced Scorecard (Kaplan and Norton 1992)

Consequently, it is assumed that the four perspectives are linked on a cause-and-effect basis, which is recognized as one essential aspect of the BSC, while the vision and strategy are always at the heart of the four perspectives. Innovation and learning

develop new processes and technologies that decrease costs and increase efficiencies in the internal business perspective, which in return provides more value to the customer and therefore satisfies them, and will finally reap improved financial results.

Although the BSC has been applied to measure the organization's performance widely (Marr, 2001), but its impacts on organization financial performance are mixed and dependent (Banker et al. 2000; Braam and Nijssen 2004; Neely 2008; Olson and Slater 2002). Olson and Slater (2002) find that successful implementation of BSC is highly linked to its impact on financial performance, while its weakness in the field of implementation process is intensively criticized by researchers (Neely and Bourne 2000; Norreklit 2000,2003). Banker et al.'s (2004) statistical results show that the influence of the BSC on financial performance highly depends on whether it is linked to the firm strategy, and similar conclusion is also made by Braam and Nijssen (2004). This empirical result demonstrates that the BSC is successful when it serves as a strategy management system, while many organizations fail to do so. Neely's (2008) experimental research even does not find any positive association between the implementation of the BSC and the organization financial outcome.

As reviewed previously, however, the popularity of BSC also has spread to the construction industry, reflected in the figure that 24.5% of surveyed construction engineering firms have adopted BSC (Robinson et al. 2005b). It can be found in the construction management literature that BSC is widely applied to design PM frameworks (Bassioni et al. 2005; Kagioglou et al. 2001), to design empirical measurement system (Yu et al. 2007), to conduct case study for measuring strategic performance (Luu et al. 2008), and to quantify firm performance when investigating performance discrepancies (Kim and Arditi 2010). The main criticism of BSC application presented by construction researchers are the absence of some critical dimensions, e.g., project management and supplier performance (Bassioni et al. 2005; Kagioglou et al. 2001). These researches provide various methodologies for applying BSC in the construction industry, and thus support the application of BSC in this research.

Knowledge Gap

The literature review has shown that as the globalization and internationalization have an increasing effect of the success of AEC firms worldwide, lots of index systems tend to evaluate the degree of internationalization, which reflects the international expansion of firms, and various researches also uncovered the determinants of the success of AEC enterprises in the international construction market. Further, although performance measurement in the construction industry is likely project-focused, evaluating the performance of AEC firms has gained increasing interests and application of BSC are maturing both in practice and in research. However, some aspects are not covered by those researches who tend to understand the overall performance of AEC firms who are active in the international construction market, e.g., international construction performance. Since international construction performance is derived from the process of international expansion as well as the support that AEC firms gain from the domestic market, it is quite different from the overall performance of AEC firms, which plays an indispensible role in monitoring processes, measuring/evaluating performance, identifying whether strategies

are aligned appropriately and achieved successfully, and influencing organizational/people behavior to add value to projects, organizations, and stakeholders, even though these characteristics have not been understood completely in the construction context. Overall, evaluating the international construction performance of AEC firms is urgently necessary, especially for Chinese AEC enterprises, which are still striving to survive and struggling to compete with their strong and experienced counterparts from developed countries.

RESEARCH METHODS

The research framework of this study consists of three steps: i) designing the framework; ii) weights of the framework and assessment methods; and iii) case study (see Figure 2). These three research stages are then discussed in details.

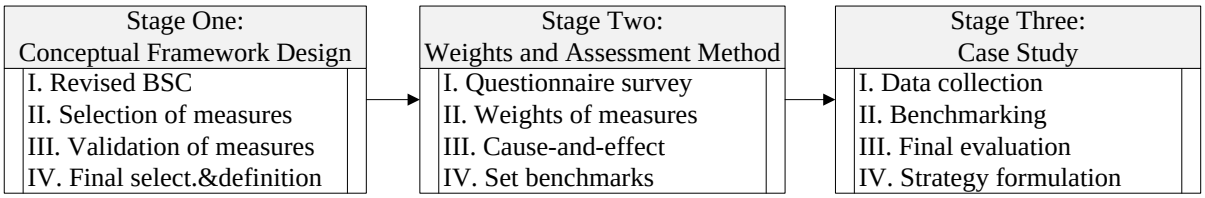

Figure 2: The Research Framework

The BSC approach is firstly adopted to design a revised framework for evaluating the international construction performance of AEC enterprises as the BSC is criticized by construction management researchers that it lacks of project and supply chain dimensions (e.g., Bassioni et al. 2005; Kagioglou et al. 2001). Literature review is then conducted to select appropriate measures under the proposed six dimensions, that is, financial, market, customer, stakeholders, internal business, and learning and innovation. The development of the conceptual framework follows a deductive perspective, i.e., reviewing the literature in the construction industry to deduct an appropriate framework for evaluating the international construction performance of AEC enterprises. With the consideration of limited concerns on the evaluation of firm performance in construction context, an inductive way is then adopted to validate the framework through in-depth discussion with senior professionals and academics. It is believed that two-stage design of the framework is robust to address the multidimensional and dynamic issue of the international construction performance of AEC enterprises. The literature review and deductive reasoning produced 35 measures, while 26 measures were validated and selected at the second stage through a seminar conducted in Hong Kong. Participants of the seminar are academics and senior/department managers, who have at least 10 year working experience in the construction industry. They came from a range of professional backgrounds, such as surveying, civil engineering, design, and contracting. These participants were initially invited to participate in the discussion of various topics in the construction industry, while the international construction performance of AEC Enterprises is one of these topics discussed. A detailed description of research background and objective was introduced, and definitions of each measure were provided to the seminar within a 5-page document. The selection of measures is based on two simple rules, i.e., content relevance and assessment

feasibility, and finally, detailed definitions were gained consensus among these participants in the seminar.

Given that different measures may gain different importance in practice, determining the importance of each measure is needed. The importance of performance measures reflects the real practice in construction context, indicating that understanding this issue is not only essential to evaluate the performance, but also it is useful to understand the practical thinking about performance measurement in the construction industry. Therefore, a questionnaire survey is conducted to investigate the importance of these selected measures in practice and to understand the perceived relationship among them using a five-point Likert scale (5-very important, 1-not important at all). Forty seven valid responses were received among 200 questionnaires delivered to senior managers who are close to international practices and high-level business management in the construction industry, indicating a response rate of 22.4%. Because there is very limited public information about senior/department managers and low response rate of questionnaire survey is quite common in the construction industry, a self-administered survey is then conducted in this research. This undoubtedly results in a reasonable response rate, but hampers the generalizability of the result. Considering the nature of this research, i.e., designing a robust framework for evaluating the international construction performance of AEC enterprises rather than understanding the significance of single measures in the construction context, this approach is regarded as reasonable in this situation. The result is also confirmed by calculating the Cronbach's α, a statistical measure used to consider the internal reliability when multidimensional scale is used. Despite the small sample size, it shows a satisfactory internal reliability (Cronbach's α), ranging from 0.604 to 0.866 (see Table 4). When the weights are calculated, assessment tools are presented by considering the definition of measures, e.g., data source, evaluation method, benchmarks setting. It should be noted that benchmarks of non-financial measures are very important at this stage as they may influence the accuracy of evaluation results. Therefore, settled benchmarks for non-financial (subjective) measures are based on the view of experts on understanding the international construction market and the international construction performance of AEC enterprises worldwide. Furthermore, as discussed previously, the cause-and-effect paradigm is the premise of a performance measurement framework, and it also may influence the success of applying a specific framework in a specific organizational context. To reflect the causality of this framework, correlation analysis is then adopted at this stage. Although it is difficult to validate the causality through such an approach, the correlation between importance score indirectly demonstrates the related relationship among a set of measures.

The case study approach is used for two reasons: firstly, it presents a practical way for those professionals who would be interested in applying this framework to evaluate the international construction performance of their companies; and secondly, it may encounter practical issues when real evaluation is applied, and in turn, it would provide recommendations for revising the framework to make it more practical and applicable. Due to the data availability, a Chinese AEC firm is selected to validate the robustness and usefulness of the framework proposed at the first and second stage. In the case study, a benchmarking approach is adopted to compare the international construction performance

of the case study firm with its international counterparts. The international construction performance of nine top international AEC firms are simultaneously evaluated to provide external benchmarks for the case study firm, and benchmarking results are used to formulate related internationalization strategies. To make sure the accuracy of performance evaluation (specifically subjective performance), the performance of these 10 firms (one case study firm and 9 benchmarking firms) was evaluated separately by these two authors. Very little difference was found, while consensus was made after a discussion. The data of the case study firm is also reviewed and validated by a senior manager from the case study firm.

STAGE ONE: DEVELOPING THE FRAMEWORK

The logic underlying the BSC is that innovation and learning develop new processes and technologies that decrease costs and increase efficiencies in the internal business perspective, which in return provides more value to the customer and therefore satisfies them, and will finally reap improved financial results. Despite some criticisms presented to this causal logic (for example, Norreklit 2000,2003), it is regarded as a premise of the framework, which integrates financial perspective with other subjective aspects, e.g. learning and innovation. Although perspective of learning and innovation is problematic in the construction industry as a result of its fragmented nature, this perspective at the company level also can reflect the capability of integrating knowledge and innovating in less innovative industry. Further, the construction industry is also characterized as an industry that various stakeholders with quite different business objectives are involved in the construction processes. Given this, stakeholder perspective is critical to understand the construction business and it is also essential for AEC enterprises to understand their critical stakeholders, who may contribute to the overall international construction performance. In addition, the international construction performance is essentially reflected by the dominance in the international construction market. Unlike the BSC, we propose that the market perspective is extremely critical for AEC firms who are competing in the international construction market, while it complements with financial perspective, which constitutes the eventual objective of a firm, i.e., gaining sustained success in long turn. Besides the brief explain of these three perspectives (learning and innovation, stakeholders, and market), other traditional perspectives of BSC are also included in our framework (internal business process, customers, and financial perspective). Thus, the framework designed to evaluate the international construction performance of AEC enterprises consists of six dimensions, i.e., financial, market, customer, stakeholders, internal business, and learning and innovation.

Setting up financial goals of AEC firms is the first step to implement performance measurement initiatives within the organization, and it is also the critical basis of benchmarking externally. Apart from traditional financial measures, e.g., return on net assets, cash flow and profitability, sustained growth of existing income and increasing profit from the international market are critical aspects of international construction performance of AEC firms, which have direct effects on better economic performance of AEC firms ultimately.

Expanding the international construction market reflects AEC enterprises' capabilities in winning and operating construction projects worldwide. In fact, the international construction performance of AEC enterprises is directly reflected by overseas income, while we select four measures to evaluate this perspective, i.e., the number of dominant market, the proportion of overseas income, number of operating countries, the growth rate of overseas income. The market performance is significantly influenced by long-term firm strategy and the efficiency of internal business process, while they jointly contribute to the financial performance. It would also indirectly reflect the capability of satisfying customers and managing stakeholders.

Enhancing the customer value will lead to close customer relationship and excellent operations, especially for the construction industry. Three ways may be proven useful for enhanced customer value: i) strengthening consulting business, providing professional and excellent consulting services so as to improve their satisfaction and make smooth for acquiring later service; ii) maintaining excellent standards of construction service, providing more excellent reliable products and services so as to further improve the image of the firm; and iii) enhancing advantage of operation management, making full use of its established good standards to serve operation management, and shortening response time of service so as to enhance customer satisfaction and reduce customer complaints.

Focusing on stakeholders is important for AEC firms to achieve sustained performance and success, which will be more critical for those that are striving to compete in the international construction market, where various stakeholders with different objectives are involved in the construction process. As construction projects generally involve in a huge amount of capital and a large number of stakeholders, e.g., end-users, developers, sponsors and/or investors, various institutions or local governments, some stakeholders are usually overlooked, e.g., the end-users, which leads to high operation costs. Therefore, AEC firms, as the important participant, should consider interests of end-users and final operation costs from the professional view during the construction process, which will enhance the reputation and add the market value to the firm.

Integrating internal business process indicates the capabilities of the firm in translating intangible resources into tangible results. It should be noted that the following five aspects can be implemented to achieve integration of internal business: i) continuate innovation of business; ii) enhance operational efficiency; iii) expand financing channels and improve the cost-control strategy; iv) guarantee quality and safety; and v) insist on technological innovation.

Enhancing the learning capacity to support the implementation of strategies is a weak area for AEC firms because of the project-based business and the temporary project management team, but it should be highlighted by AEC firms to gain sustained international construction performance. The ability of learning and innovation is the base of improved operation efficiency and added value of shareholders, customers and other stakeholders, and it is derived from the intangible assets of enterprises comprising human capital, information capital and organizational capital.

In sum, similar with the causal premise of BSC, this framework proposes that the learning and innovation would contribute to improving internal efficiency of business processes, which in term benefits for the firm to satisfy its customers and stakeholders.

Consequently, satisfied customers and full consideration of stakeholders will result in a higher market performance and a more competitive position in the international construction market, and finally the firm can reap financial benefits to maintain sustained success in long term. The six dimensions of the framework and detailed measures of the international construction performance of AEC firms are presented in Table 2. Following rules are embedded in the implementation of the framework:

In order to reflect the real situation of enterprises and reduce adverse effects caused by data fluctuation, all value of quantitative indicators should be based on the average value of three consecutive financial years.

Qualitative indicators are evaluated in according to the five grades: excellent, very well, good, general and poor, and score them from 5 to 1 respectively.

In order to reflect the priority of indicators, weights are assigned based on the questionnaire survey; calculating the weights of selected measures is based on a simple equation:

$$w_i = M_i / \sum_{i=1}^{m} M_i \qquad (1)$$

w_i is the weight of measure i; M_i is the mean score of measure i; m is the number of measures under each dimension.

In order to enable comparability between different indicators, the value of all indicators is finally converted into a 5-point scale format through the method of dimensionless conversion. Calculation of the final score of international construction performance is based on:

$$P = \sum_{j=1}^{6} w_j \cdot D_j \qquad (2)$$

$$D_j = 5 \cdot \sum_{i=1}^{m} w_i \cdot \frac{d_i - \min}{\max - \min} \qquad (3)$$

$$w_j = \sum_{i=1}^{m} M_i \Big/ \sum_{i=1}^{26} M_i \qquad (4)$$

P is the overall international construction performance; D_j is the performance score of dimension j; w_j is the weight of dimension j; d_i is the value of measure i under the dimension j; max is the maximum value of measure i among evaluated firms; min is the minimum value of measure i among evaluated firms.

STAGE TWO: VALIDATION AND WEIGHTS

The proposed framework with detailed measures is further validated by calculating the correlation coefficient among the 26 measures (see Table 3). The premise of BSC is the cause-and-effect relationship among the four dimensions, that is, innovation and learning

develop new processes and technologies that decrease costs and increase efficiencies in the internal business perspective, which in return provides more value to the customer and therefore satisfies them, and will finally reap improved financial results. This perspective is also embedded in the proposed framework, which is more comprehensive than the BSC by considering the characteristic of the construction industry and internationalization. The validation process presented here is based upon the point that managers' perception on the importance of the 26 measures indirectly shows the internal relationship among them. It is assumed that more significant correlations between different dimensions, e.g., internal business and market, demonstrate more robust relationship between them. However, interpretation of the cause-and-effect association through the table would be problematic. Table 3 shows that the dimensions of learning and innovation, internal business, customers, stakeholders are highly correlated, the dimension of financial is intensively correlated with customer and internal business, while the dimension of market is significantly correlated with the dimensions of learning and innovation and stakeholders. Finally, the weights of international construction measures are presented by calculating mean score of single measures (see Table 4), and the weights of the six dimensions are based on the averaged value of contained measures.

We used Cronbach's α to assess the internal reliability among different measures under each dimension. The result shows that the internal reliability of these six dimensions of the framework is generally reasonable as four of them gain a satisfactory reliability score ($\alpha>0.7$). The perspective of learning and innovation gains highest internal reliability ($\alpha=0.866$), followed by financial perspective ($\alpha=0.738$), market perspective ($\alpha=0.735$), and internal business perspective ($\alpha=0.772$). In addition, an α score with higher than 0.6 is regarded as acceptable, then customer perspective ($\alpha=0.649$) and stakeholders perspective ($\alpha=0.604$) have reached this requirement.

From the view of professionals in the construction industry, the efficiency of internal business is the most important perspective of the international construction performance of AEC firms, closely followed by the perspective of learning and innovation and the perspective of customers. This result indicates the fact that operational capabilities, especially operating construction projects overseas, are regarded as the most important way to gain sustained competitive advantage in the construction market. Implementing projects efficiently directly result in the performance result of AEC firms. Specifically, among these internal business measures, supply chain management is rated as the most important measure, with a high importance score of 3.94. Monitoring the supply chain performance is then significant as construction processes are really fragmented and various suppliers are involved in the project. Therefore, AEC firms need to integrate the supply chain and measure it for further integration.

Although the learning and innovation perspective of the BSC is criticized by construction management researchers because of the unique nature of construction project business, it gains a significantly high importance, with an average score of 3.95. This can be partly explained by the poor profile of learning and innovation practices in the construction industry. Construction is characterized as a low innovative industry, which has gained increasing attention. Continuous learning and innovation (R&D in brief) have been highlighted as a driver and opportunity of construction improvement by various industry

reports. It is confirmed from this research that learning and innovation are increasingly and explicitly important in the construction context although lots of industry-characterized obstacles still exists, such as the fragmented set of stakeholders.

It is claimed that the construction industry should be client-driven, and satisfying clients' requirement is realized as a critical success factor of construction projects and their organization. However, the tough situation that the industry faces is that customers of the construction industry (both end-users and clients) are generally under-satisfied (Egan 1998). The survey result indirectly confirms this argument as the customer perspective gets a high importance score (with 3.93). Considering the customer requirements, delivering value to the customer, and positively cooperating with customers are the main proponents of customer perspective in this framework. In the international construction market, how to satisfy customers would be more complicated than that in domestic market because long-term relationship-based collaboration is much difficult between AEC firms and international clients who live in different cultural, political, and economical environment.

In contrast, other three perspectives are less important, but the difference is slight except the perspective of market. The importance scores of financial perspective and stakeholders' perspective are slightly lower than the previous three perspectives as discussed above, with 3.72 and 3.78 respectively. It is surprised that the market perspective gains a very low importance score, with only 3.39. The market performance of AEC enterprises is less important than other perspectives, because the international construction performance can hardly transitioned into financial performance, in comparison with other industries, e.g., the manufacturing, where market performance directly results in economic performance of manufacturers. In fact, given that the concentration ratio of construction market is really low, which means that market performance can hardly reflect the real situation of AEC firms. In sum, the result as discussed above is highly consistent with the development trend of performance measurement in general, i.e, leading perspectives/measures are increasingly critical and useful to evaluate the performance of organizations while lagging measures have been proven its shortcomings in terms of identifying problematic areas (and more importantly why these areas are problematic). In this framework, we propose that learning and innovation, internal business, and customers are the most important areas, showing the importance of leading performance measures.

STAGE THREE: CASE STUDY—A CHINESE AEC FIRM

Background

China's economic status has been acclaimed for dramatic changes over the 30 years of implementation of the Policy of Reform and Opening (Xu and Fang 2008). In recent years, Chinese government has been advocated the country's public and private enterprises expanding their business and pursuing overseas investment. Since China' entry into World Trade Organization in 2001, the strategy of 'Going Out' has intensified by the government to encourage Chinese companies to embrace "The Two Markets" – the domestic and foreign markets. As a result, there have been an increasing number of Chinese enterprises seeking for international expansion from domestic market into the international construction market with an ambition of becoming internationalized corporations. Despite

the advocacy of government, the performance of the Chinese AEC enterprises was still lagging behind other international construction counterparts from United States, Europe and Japan.

In contrast to the domestic market, the international construction market is large, expanding, fragmented, regionally fluctuating, heterogynous, risky, and highly competitive (Chen 2005). Carrying out projects involves the consideration of a wide range of issues such as policy, tariff, culture, diplomatism and technology (Cii 2003; Han and Diekmann 2001; Mawhinney 2001). To guide the international operation strategy of AEC firms, it is important to evaluate the AEC firms' performance of international operation appropriately. It is believed that the investigation of international performance of Chinese AEC enterprises in this study will provide information on major weaknesses of the Chinese AEC enterprises in terms of international performance compared with those top international construction enterprises.

The Process

In order to illustrate the effectiveness the evaluation system, a case study of a Chinese AEC firm is then conducted. A benchmarking approach is adopted to evaluate the international construction performance of the AEC firm, and thus, nine top ENR contractors are randomly selected to set external benchmarks during the case study phase. The evaluation process is briefly discussed here:

Profile of the case firm. The case firm (named 'CF-China' here) is one of the largest construction enterprises and also one of the largest international contractor s in China. It has been listed as one of the world top 225 international contractors by ENR since 1980s, and it also gained an international reputation for the achievement of a large number of remarkable projects over past few decades. CF-China has been recognized as a well-known trademark in both domestic and international construction market. As one of the largest construction contractor in China, CF-China has been consistently engaged in the construction business in more than 50 countries and areas worldwide, and its business is diversified, including construction, property development, construction services and investment.

Selection of best practice companies. The nine international construction companies were randomly selected from both list of Fortune Global 500 and list of ENR Top 50 international contractors. These two lists were employed because most of these companies are from OECD countries with sizable international operations; secondly, the international performances of these companies are the subject of interest in the study.

Data collection. Quantitative data was primarily collected from annual reports of each firm, books, industry journals, academic journals, newspapers, and official websites of these companies, while qualitative data was collected from a wider range of data source, e.g., websites, expert interview, journal papers, and magazines. Qualitative data was also validated by interviewing with staff from CF-China.

The Evaluation Result

The evaluation result is shown in Table 5. Several conclusions can be made here:

The market development is weak. For the market development situation, the nine companies have entered the main construction market throughout the world, such as Europe, the United States, Latin America, Asia, the Middle East and Africa. Furthermore, they are dominating these construction markets, and have formed their own marketing network. In comparison, CF-China mainly operates in Hong Kong and Macao, and it is dominating the market in these two regions. However, the expansion to other overseas construction market is very limited. Although it started this activity several years ago and won some construction contracts, it has not formulated a stable market network. Thus, there is a sharp gap between CF-China and other nine firms in terms of market expansion and development, reflected from the figure that the value of all measures of market dimension are the lowest in comparison with its international competitors.

The financial performance is moderate. The financial performance of CF-China is on the average level compared with other international contractors. This might be because selected financial measures, such as return on assets and the rate of revenue growth, are related to firm size. Despite its moderate financial performance, it is still much lower behind AEC 1, indicating a sharp gap in comparison with the best performer in the market.

CF-China fails to meet customer's needs. The performance of customer dimension of CF-China is lowest, showing its failure in terms of meeting customer's needs. This may be because CF-China aims to meet the customer's needs at the construction phase, not the whole life cycle of projects. Although CF-China are qualified in accomplishing projects in quality, on time, and in budget, a large proportion of its construction contracts were won by price competition and incentives, which may lead to low customer loyalty and weak client relationship. Thus, it weakens the international reputation and results in less trust from clients, and further results in the loss of contracts. By contrast, the nine firms generally have a close and intimate relationship with their clients and/or customers, and they tend to provide them complete and integrated solutions for satisfying their needs, which is, however, the most essential benefits and value to clients. Services covered the phases of planning; design, construction, and operation enable these top contractors to avoid low-price competition and access to huge profits as well as improved customer loyalty and dependence.

CF-China needs higher and more sustained international reputation. The performance of stakeholder dimension shows its low international reputation compared with its international competitors. CF-China has spent many resources on various aspects of project end-users, e.g., energy-saving, environmental protection, and corporate social responsibility, resulting in the good effectiveness in meeting the demand of stakeholders, and thus the gap in these areas is very small. But strategies should be implemented to improve its international reputation.

An integrated supply chain is needed for CF-China to achieve the excellent internal business performance. The evaluation process indicated that the nine international contractors have a common characteristic, that is, their business covers the entire value chain of the construction industry through both horizontal integration of construction-related businesses and vertical integration of upstream and downstream of the industrial chain. For example, most of them have business in various sub-industries, e.g., housing construction, manufacturing industry, energy facilities, water conservancy

facilities, chemical industrial facilities; transport facilities, waste disposal, sewage treatment, and communications facilities. More importantly, a large number of these businesses are ranked in top ten in ENR225, but only housing construction business that CF-China operates is ranked in top 10 in ENR225. In terms of vertical expansion, most of the benchmarked firms achieve a market-leading position in the areas of construction consulting services, real estate development, infrastructure investment, and property and facilities management, which pushes them become a supplier of integrated construction services, whilst CF-China, as a market follower, is necessary to enhance its expansion vertically and horizontally.

Insufficient investment in R&D. The evaluation of the performance of learning and innovation is qualitative, while it shows that there is a considerable gap between CF-China and the nine benchmarked firms. The nine international contractors have established a sound R&D management organization, they have a number of highly qualified R&D professionals, and they also invest a lot on conducting researches with external universities and research institutions. Although it hard to quantify the R&D output, the evaluation shows a consistent R&D effect on operational capacity and competitive advantage. Additionally, qualitative evaluation of other measures demonstrates a large gap between CF-China and the nine benchmarked firms.

The overall international construction performance of CF-China is really low in comparison with its international competitors. All of benchmarked firms had a value higher than 2.50, and some of them achieved value of above 3.00, whilst CF-China only got 1.91, indicating that CF-China should implement a comprehensive framework of internationalization strategies to narrow the gap with its competitors in the international construction market. However, strategy re-formulation is not discussed here.

DISCUSSIONS, LIMITATIONS, AND CONCLUSIONS

Practical application of these conceptual frameworks (e.g., BSC, EFQM) is increasingly popular in the construction industry, and many researchers have adopted a BSC approach to measure the performance of construction firms. Previous researches have shown that the BSC approach is appropriate for construction firms, but some unique characteristics of the construction industry should be considered to make the application more smooth and effective (Bassioni et al. 2005; Kagioglou et al. 2001), e.g., project management and supply chain, which is consistent with current research that the dimensions of stakeholders and market are added into the BSC framework to make it more appropriate for AEC firms. Furthermore, the questionnaire survey among senior managers of AEC firms have validated internal relationships of the proposed framework, although the content validity and assessment feasibility of measures have been eliminated by applying export interviews and the seminar with academics previously. In terms of international construction performance, this research stated that previous researches focused more upon the internationalization process, not the overall performance of AEC firms, which holds a more comprehensive view and has been proved that it is more useful to identify the weak areas and main constraints of the internationalization activity and competitiveness in the international construction market. Therefore, this research made two contributions to the

knowledge of performance measurement, i.e., the significant extension of international construction performance evaluation and new approach to revising the BSC for AEC firms.

Measuring intangible aspects of performance has gained significant interest in other industries, while the result in this research also confirmed the importance of measuring intangibles in the construction industry. Being consistent with the original framework (i.e. BSC), learning and innovation, efficiency of internal business, and customers are critical to improve the financial performance, and measuring these intangible aspects would be effective to identify the weak areas that hamper financial outcomes. However, measuring intangible aspects needs robust measurement design, including data collection and data analysis, while this is a tough task for AEC firms. It is argued that simply measuring these areas would not make much sense for them to identify weaknesses, make decisions, and take actions because measurement error may largely influence the result, making the evaluation insignificant.

However, there are several limitations to the research. Firstly, the development and selection of measures under the proposed six dimensions were based on the full consideration of the situation of the case study firm, which means that this framework have some specific applications. For example, it is limited to evaluating the international performance of large contractors, while it may be problematic for those small and medium firms. Secondly, as discussed previously, the cause-and-effect relationship among selected measures has not been validated and tested, whilst it is regarded as the premise of BSC. Further research needed to test the causal relationships by applying the real performance data rather than perceptions of respondents, as the latter one cannot provide full evidence for the validation of cause-and-effect relationships. The last limitation discussed here is that the evaluation of qualitative measures needs much time and effort and it also may have a direct impact on the accuracy of the evaluation result. Therefore, external institutions or assessors should be invited to evaluate these qualitative measures as self-assessment may easily lead to biased evaluation.

In conclusion, it is believed that the proposed framework has practical implications for those who are striving to compete in the international construction market, and the case study has shown its applicability in terms of evaluating the international construction performance of large international contractors and formulating the internationally competitive strategies. Lastly, as one of the largest AEC firms in China, the international construction performance of the case study firm is much lower than its competitors for several reasons, e.g., insufficient investment on R&D, weak integration of value chain of the construction services, failure to meet clients' needs, and less international reputation in the construction market. However, these weak areas may be common for Chinese AEC firms, and most of them are competing at the similar level because of their similar company size, organizational capabilities as well as weak areas and constraints of international development and expansion (c.f. Wang 2004). Thus, what the research result points out here is that Chinese AEC firms need to adopt diversified strategies for sustained performance and success.

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APPENDIX: TABLES

Table 1 Determinants of the success of AEC firms in the international construction market

Factors	Seymour (1987)	UNCTC (1989)	MATF (1991)	ICTF (1993)	Linder (1994)	Flanagan (1994)	Kong (1994)	Pietroforte (1997)	Jennings and Holts (1998)	Cuervo and Low (2003)	Low and Jiang (2003)	Ling et al. (2005)	Ling and Kwok (2007)	Zhao and Shen (2008)
Firm's reputation and track record	△	△			△	△			△	△		△		△
Business coverage														△
Corporate knowledge	△													
Communication structures	△													
Effective resources allocation				△										
Capabilities in management and strategic planning	△	△										△		
Good language skills					△	△								△
Well-trained human resources						△				△				△
Technological supremacy and innovation						△						△		△
Government incentive											△			
Leadership or vision				△										
Social acceptability				△		△								
Strong financial capability and supports						△						△	△	△
Organisational effectiveness				△										
Flexibility						△	△						△	
Partnership, alliances and joint ventures			△		△	△		△						
Knowledge of foreign countries' systems & policies					△	△								
Low price of construction components														△

Table 2 Detailed Measures of the framework for measuring the international construction performance of AEC firms

Dimensions	No.	Indicators	Definition and Metrics
Finance	F-1	Total assets turnover	Total Asset turnover =Total Revenue /Total Asset
Performance	F-2	Return on equity	ROE＝(net profit - preferred stock dividend)/(shareholders equity)×100%
	F-3	Turnover growth rate	Enterprise's operating revenue year on year growth rate
	F-4	Operating profit	Operating profit = Income from main operation +other operating profit – period expense
	F-5	Per capita sales	Per capita sales=total turnover/number of employees
Market	M-1	The number of dominant market	The number of countries or regional markets in where it become main contractor or at least enters the top 10.
	M-2	The proportion of overseas income	The ratio=overseas income/total income
	M-3	Number of operating countries	The number of countries and regions where enterprises has entered (including all kinds of entry mode).
	M-4	Growth rate of overseas income	The growth rate of enterprise's overseas operating income
Customer	C-1	Value realization of customers	The satisfaction enterprise's services, including project function, quality, safety, budget and time of delivery etc.
Satisfaction	C-2	The proportion of regular customer	The proportion of sales from the regular customer in total sales. (Those has made more than one deal with the firm)
	C-3	Cooperation with customer	The relationship with customer in project cooperation, e.g., strategic partnering, ancillary services etc.
Stakeholders	S-1	Sustainable capacity	The implementation of sustainable initiatives to improve efficiency and add value for the end-user.
	S-2	Social responsibility	Social responsibility in the project development, such as environmental protection and energy saving etc.
	S-3	International reputation of brand	International reputation of enterprise, user reputation, brand value and positive reports.
Internal	I-1	The number of core businesses	The number of enterprise's core business, and construction business calculated according to 9 broad categories
Business	I-2	The average profit rate	The average profit rate of all the core business of enterprise
	I-3	The proportion of profit from construction business	The proportion of profit from construction in all business. (Using the countdown of this indicator in evaluation to reflect the degree of business's integration)
	I-4	Number of business with international competitiveness	The number of business which income enter the rank of TOP10 ENR 225.
	I-5	Coordination	The coordination and complement of all the enterprise's business, which is aim to improve the competitiveness.
	I-6	Supply chain	The efficiency and integration of the supply chain.
Learning and	L-1	Efficiency of R&D input and output	The input of resources in R&D, and the efficiency of application of output.
Innovation	L-2	Application of IT	The advantage and integration of IT development in enterprise, such as ERP, OA, CRM, HRM, SCM.
	L-3	Satisfaction of employee	Including responsibility, scope of authority, fair opportunity, training, career planning, and remuneration and so on.
	L-4	Organization & management efficiency	The leader's incentive and drive efficiency for the teamwork of organization, and diversity and cohesion of enterprise's culture
	L-5	Sharing of knowledge & information	The capacity and efficiency of internal knowledge and information sharing.

Table 3 Spearman's correlation coefficient among selected measures (Sample No.=47)

F-1	F-2	F-3	F-4	F-5	M-1	M-2	M-3	M-4	C-1	C-2	C-3	S-1	S-2	S-3	I-1	I-2	I-3	I-4	I-5	I-6	L-1	L-2	L-3	L-4	L-5
1.000																									
.454**	1.000																								
.247	.288*	1.000																							
-.172	-.159	.121	1.000																						
.325*	.321*	.590**	.224	1.000																					
.384**	.394**	.427**	-.101	.437**	1.000																				
-.018	.197	.256	.192	.051	.077	1.000																			
.511**	.354*	.223	-.028	.090	.350*	.417**	1.000																		
.234	.297*	.463**	.088	.327*	.261	.780**	.510**	1.000																	
.280	.174	.515**	.193	.515**	.551**	.243	.176	.301*	1.000																
.374**	.268	.433**	.289*	.590**	.366*	-.090	.042	.088	.358*	1.000															
.305*	.253	.386**	-.026	.420**	.301*	.253	.091	.390**	.251	.308*	1.000														
.408**	.365*	.185	.055	.493**	.299*	.186	.341*	.398**	.188	.272	.222	1.000													
.347*	.151	.421**	.225	.479**	.246	.123	.255	.191	.424**	.482**	.275	.378**	1.000												
.387**	.242	.330*	-.173	.275	.452**	.308*	.333*	.435**	.367*	.098	.306*	.388**	.209	1.000											
.305*	.148	.324*	.114	.464**	.401**	.029	.147	.315*	.404**	.357*	.537**	.252	.242	.436**	1.000										
.425**	.139	.449**	.432**	.585**	.127	.067	.041	.272	.441**	.649**	.328*	.335*	.530**	.100	.355*	1.000									
.371*	.399**	.443**	.068	.423**	.371*	.237	.421**	.373**	.317*	.508**	.355*	.375**	.405**	.083	.357*	.509**	1.000								
.228	.361*	.384**	-.029	.295*	.373**	.615**	.357*	.706**	.249	.124	.420**	.329*	.174	.439**	.257	.162	.387**	1.000							
.382**	.268	.366*	.009	.545**	.512**	.012	.121	.171	.415**	.439**	.337*	.312*	.305*	.382**	.253	.393**	.309*	.204	1.000						
.293*	.209	.505**	.339*	.597**	.290*	.075	.200	.269	.345*	.506**	.263	.434**	.517**	.432**	.351*	.457**	.256	.205	.543**	1.000					
.419**	.275	.359*	-.015	.381**	.325*	.385**	.530**	.438**	.400**	.287	.314*	.452**	.388**	.319*	.155	.305*	.474**	.380**	.363*	.337*	1.000				
.439**	.233	.389**	.192	.574**	.453**	.121	.137	.261	.452**	.596**	.507**	.507**	.463**	.312*	.323*	.446**	.382**	.169	.546**	.535**	.498**	1.000			
.304*	.444**	.578**	.135	.502**	.346*	.283	.225	.284	.396**	.372**	.307*	.308*	.180	.227	.222	.321*	.497**	.341*	.397**	.465**	.595**	.420**	1.000		
.172	-.032	.445**	.240	.606**	.132	.139	-.094	.184	.471**	.509**	.376**	.339*	.493**	.300*	.377**	.586**	.291*	.106	.566**	.611**	.495**	.621**	.543**	1.000	
.148	.189	.514**	.070	.363*	.151	.439**	.140	.506**	.524**	.240	.281	.319*	.447**	.317*	.134	.405**	.334*	.431**	.383**	.440**	.589**	.480**	.483**	.616**	1.000

Note: **. Correlation is significant at the 0.01 level; *. Correlation is significant at the 0.05 level.

Table 4 Weights of international performance measures and assessment tool (Sample No.=47)

No.	Measures	Mean	SD	Weights	Assessment Tool	
					Method	Unit
Finance (Cronbach's α=0.738)		***3.72***	***0.72***	***0.16***		
F-1	Total assets turnover	3.60	1.10	0.19	AD	$
F-2	Return on equity	3.77	1.15	0.20	AD	%
F-3	Turnover growth rate	3.79	1.08	0.20	AD	%
F-4	Operating profit	3.98	1.15	0.21	AD	$
F-5	Per capita sales	3.49	1.12	0.19	AD	%
Market (Cronbach's α=0.735)		***3.39***	***0.86***	***0.15***		
M-1	The number of dominant market	3.49	1.20	0.26	AD	E
M-2	The proportion of overseas income	3.47	1.14	0.26	AD	%
M-3	Number of operating countries	3.19	1.06	0.24	AD	E
M-4	Growth rate of overseas income	3.40	1.19	0.25	AD	%
Customer (Cronbach's α=0.649)		***3.93***	***0.75***	***0.17***		
C-1	Value realization of customers	4.00	1.00	0.34	EA	S
C-2	The proportion of regular customer	3.66	1.01	0.31	AD	%
C-3	Cooperation with customer	4.13	0.95	0.35	EA	S
Stakeholders(Cronbach's α=0.604)		***3.78***	***0.68***	***0.17***		
S-1	Sustainable capacity	3.98	1.07	0.33	EA	S
S-2	Social responsibility	3.79	0.98	0.31	EA	S
S-3	International reputation of brand	4.30	0.78	0.36	EA	S
Internal Business(Cronbach's α=0.772)		***4.02***	***0.71***	***0.18***		
I-1	The number of core businesses	3.70	1.00	0.16	AD	E
I-2	The average profit rate	3.77	1.03	0.17	AD	%
I-3	The proportion of profit from construction business	3.85	1.02	0.17	AD	%
I-4	Number of business with international competitiveness	3.81	0.97	0.17	AD	E
I-5	Coordination	3.62	0.90	0.16	EA	S
I-6	Supply chain	3.94	1.03	0.17	EA	S
Learning and Innovation(Cronbach's α=0.866)		***3.95***	***0.75***	***0.17***		
L-1	Efficiency of R&D input and output	3.70	1.10	0.19	EA	S
L-2	Application of IT	4.00	0.81	0.20	EA	S
L-3	Satisfaction of employee	4.00	0.96	0.20	EA	S
L-4	Organization & management efficiency	4.21	0.88	0.21	EA	S
L-5	Sharing of knowledge & information	3.83	1.13	0.19	EA	S

Note: AD—**Archival Data** derived from corporate reports and third-party data sources; EA—**Expert Assessment** of these measures based on a comprehensive understanding of target AEC enterprises; $--US Dollars; E—Each; S—Scale 1-5.

Table 5 Evaluation results of the case study firm

No.	ICP Measures	Case Firm	AEC 1	AEC-2	AEC 3	AEC 4	AEC 5	AEC 6	AEC 7	AEC 8	AEC 9
Finance		***2.09***	***3.65***	***2.28***	***1.53***	***1.73***	***0.93***	***2.02***	***2.11***	***1.80***	***1.46***
F-1	Total assets turnover (%)	1.27	2.26	1.47	1.55	0.86	0.68	1.42	0.83	0.81	0.99
F-2	Return on equity (%)	32.30	40.97	12.87	8.30	19.60	8.30	24.00	8.50	7.70	12.50
F-3	Turnover growth rate (%)	22.60	26.43	14.44	14.71	11.47	18.70	19.32	6.57	6.40	19.84
F-4	Operating profit (1,000,000 US dollars)	66.94	289.80	347.43	242.85	422.79	171.80	111.24	471.37	362.01	51.16
F-5	Per capita sales (10,000 US dollars)	29.18	22.97	85.34	21.69	20.00	7.65	52.19	150.50	151.90	77.80
Market		***0.00***	***1.30***	***3.38***	***3.60***	***1.02***	***2.57***	***2.51***	***2.06***	***1.81***	***3.13***
M-1	The number of dominant market	3.50	5.00	5.00	6.00	4.00	5.00	4.00	6.00	6.00	7.00
M-2	The proportion of overseas income (%)	1.93	15.00	72.00	66.00	21.03	58.67	49.00	13.00	16.60	71.00
M-3	Number of operating countries	9.00	20.00	40.00	45.00	20.00	33.00	15.00	25.00	15.00	15.00
M-4	Growth rate of overseas income (%)	2.42	11.00	35.00	21.00	10.00	13.00	85.00	28.30	29.40	25.70
Customer		***0.97***	***4.72***	***4.07***	***4.42***	***2.99***	***4.18***	***4.04***	***4.31***	***3.23***	***4.07***
C-1	Value realization of customers	1.00	3.50	4.00	3.25	3.00	3.25	3.75	3.75	3.75	3.25
C-2	The proportion of regular customer (%)	62.00	65.00	61.00	65.00	60.00	65.00	62.00	63.00	57.00	64.00
C-3	Cooperation with customer	1.23	4.00	3.75	3.75	3.25	3.38	3.63	3.75	3.88	3.50
Stakeholders		***2.72***	***3.52***	***3.52***	***3.52***	***3.52***	***3.52***	***3.52***	***3.52***	***3.52***	***3.52***
S-1	Sustainable capacity	3.00	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
S-2	Social responsibility	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25	3.25
S-3	International reputation of brand	2.00	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
Internal Business		***2.11***	***1.85***	***2.35***	***3.39***	***2.66***	***2.82***	***3.59***	***2.56***	***1.89***	***2.05***
I-1	The number of core businesses	7.00	7.00	8.00	10.00	12.00	11.00	10.00	12.00	10.00	9.00
I-2	The average profit rate (%)	5.60	4.21	4.15	2.22	8.07	6.70	8.53	3.44	2.54	2.25
I-3	The proportion of profit from construction business (%)	1.11	2.33	4.00	3.23	1.33	2.13	2.22	2.38	1.49	1.39
I-4	Number of business with international competitiveness	2.00	3.00	3.00	5.00	4.00	5.00	4.00	4.00	3.00	3.00
I-5	Coordination	4.00	3.75	4.00	4.00	3.50	3.30	3.75	3.50	3.70	3.75
I-6	Supply chain	4.00	3.50	3.00	3.75	3.25	3.50	4.00	3.50	3.60	4.00
Learning and Innovation		***3.34***	***3.68***	***3.68***	***3.68***	***3.68***	***3.68***	***3.68***	***3.68***	***3.68***	***3.68***
L-1	Efficiency of R&D input and output	3.25	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
L-2	Application of IT	3.50	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80	3.80
L-3	Satisfaction of employee	3.50	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
L-4	Organization & management efficiency	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50
L-5	Sharing of knowledge & information	3.08	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75	3.75
Overall International Construction Performance		***1.91***	***3.14***	***3.21***	***3.37***	***2.64***	***2.98***	***3.26***	***3.07***	***2.67***	***2.99***