Practical Framework for Measuring Performance of International Construction Firms

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Abstract: The internationalization of construction companies has become of significant interest as the global construction market continues to be integrated into a more competitive and turbulent business environment. However, due to the complicated and multifaceted nature of international business and performance, there is as yet no consensus on how to evaluate the performance of international construction firms (ICFs). The purpose of this paper, therefore, is to develop a practical framework for measuring the performance of ICFs. Based on the balanced scorecard (BSC), a framework with detailed measures is developed, investigated, and tested using a three-step research design. In the first step, 27 measures under six dimensions (financial, market, customer, internal business processes, stakeholders, and learning and growth) are determined by literature review, interviews with academics, and seminar discussions. Subsequently, a questionnaire survey is conducted to investigate weights of these 27 performance measures. The questionnaire survey also supports the importance of measuring intangible aspects of international construction performance from the practitioner's viewpoint. Additionally, a case study is described to test the framework's robustness and usefulness. This is achieved by benchmarking the performance of a Chinese ICF with nine other counterparts worldwide. It is found that the framework provides an effective basis for benchmarking ICFs to effectively monitor their performance and support the development of strategies for improved competitiveness in the international arena. This paper is the first attempt to present a balanced and practically tested framework for evaluating the performance of ICFs. It contributes to the practice of performance measurement and related internationalization in the construction industry in general. **DOI: 10.1061/(ASCE)CO.1943-7862.0000718.**

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Introduction

The measurement of performance is critical for senior management responsible for strategic decision making and operations in general. In terms of the construction industry, several major reports (e.g., Egan 1998; Latham 1994) have pushed the performance measurement (PM) philosophy to a new level. This has resulted in the widespread use of a benchmarking approach to monitor the performance of the whole industry. For example, many countries have initiated various performance benchmarking programs. These include the UK [Construction Best Practice Program (CBPP) 2000; Office of National Statistics (ONS) 2011], USA (Lee et al. 2005), Canada (Nasir et al. 2012; Rankin et al. 2008), the Netherlands (Bakens et al. 2005), Portugal (Horta et al. 2010), and Brazil (Costa et al. 2006). Fisher et al.'s work (1995) is widely regarded as the first attempt at establishing such programs in the construction industry (El-Mashaleh et al. 2007), which now play a critical role in providing third-party benchmarks for the whole sector. Benchmarking thinking in construction, specifically as it relates to the performance of projects, can therefore be applied to compare the performance of individual firms with the industry average.

These benchmarking programs also play an essential role in fostering a quantitative measurement culture and popularizing common PM and benchmarking practices. This is particularly important for construction firms in the international construction market, well known for its turbulent business environment and strong competition, where understanding the nature of companies' performance helps in evaluating their position and strategic decision making.

However, there is as yet no consensus on how to evaluate the performance of international construction firms (ICFs). To aid this process, this paper presents a robust and practical method based on a framework containing the necessary indicators involved, a means of assessing their individual values, and their collective evaluation. After reviewing the literature related to international construction and PM in construction, the methods adopted in the research are briefly presented. This is followed by the framework development. Finally, a case study measuring the international performance of a Chinese ICF is provided to both illustrate the application of the framework and confirm its validity for evaluating the performance of ICFs.

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By developing a framework for evaluating the performance of ICFs, the research contributes both to a conceptual understanding of the nature of the indicators involved and the implementation of PM in practice, especially in enabling self-assessment, comparing strengths and weaknesses, attaining firm capabilities, and formulating related internationalization strategies.

Literature Review

Understanding Internationalization of Construction Firms

The construction industry is usually regarded as a localized industry due to its having such characteristics as onsite construction, one-off manufacturing, and an unmovable and unduplicated product. Therefore, it is more difficult for construction firms to become global and realize internationalization goals than firms in other industries. As a result, the issues involved in improving the internationalization of the industry and enhancing the performance of ICFs have attracted much more attention over the last two decades (e.g., Best and Langston 2006; Edkins and Winch 1999; Gunhan and Arditi 2005a, b; Javernick-Will and Scott 2010; Ling and Kwok 2007; Low and Jiang 2003, 2004; Ofori 2003). Many studies have identified different determinants of the success of firms involved in the international construction market, such as strong financial capability and support (Flanagan 1994; Gunhan and Arditi 2005a; Ling et al. 2005), international networks (Gunhan and Arditi 2005a), reputation and track record (Flanagan 1994; Ling et al. 2005; Zhao and Shen 2008), well-trained human resources (Cuervo and Low 2003; Flanagan 1994; Gunhan and Arditi 2005a; Ling et al. 2005; Zhao and Shen 2008), and knowledge of the systems and policies of foreign countries (Flanagan 1994; Linder 1994).

This brief review indicates that there is some knowledge of the determinants of the success or performance of ICFs in the international market. However, a pertinent question is how success/performance can be measured. Measuring the performance of ICFs provides explicit knowledge about the internationalization of the construction industry in addition to a better understanding of how construction firms operate in the international market. This latter point is covered in more detail in the following sections.

Evaluating the Business Performance of Construction Firms

While the PM of construction firms has been much less focused on than that of their projects in the last three decades, firm-level PM has received increasing attention in the construction management literature. For example, Lin and Shen's (2007) review shows that approximately 68% of reviewed PM studies in construction are focused on the project level. Similar critical findings can also be found in Deng et al. (2012) and El-Mashaleh et al. (2007). Nevertheless, this discrepancy is decreasing since a growing number of studies have attempted to understand construction firms' performance and PM (e.g., Bassioni et al. 2005; Beatham et al. 2005; El-Mashaleh et al. 2007; Horta et al. 2010; Kagioglou et al. 2001; Luu et al. 2008a, b; Yu et al. 2007).

Some studies have been concerned with evaluating the performance of construction firms as both an internal and continuous management and one-time evaluation issue (Bassioni et al. 2004). For example, Kagioglou et al. (2001), Love and Holt (2000), and Bassioni et al. (2005) all tried to understand the performance of construction firms by designing conceptual frameworks. Kagioglou et al. (2001) designed a conceptual framework by adding two dimensions—the project and supplier perspective—to the balanced scorecard (BSC) to make it more appropriate for the construction industry's situation, where project and supplier performance are crucial to the overall performance of firms. As construction project management teams are usually temporary, the researchers further argue that innovation and learning are restricted in the industry. A more complex and comprehensive framework was designed by Bassioni et al. (2005), who build on the principles of the BSC and European Foundation for Quality Management (EFQM), presenting empirical weights of the associated dimensions (Bassioni et al. 2008). Although their interviews show that the framework is practical to some extent, its successful application is limited due to the complexities involved.

Other researchers, such as Yu et al. (2007), Luu et al. (2008a), Arditi and Lee (2003), and Beatham et al. (2005), assumed that these frameworks could be applied directly to the construction industry and used as management tools in both research and practice. Yu et al. (2007), for example, designed 12 benchmarking measures under the four perspectives of the BSC, indirectly showing that the BSC approach can be used as a strategic management tool to align strategic goals with operating practices and as a performance management instrument to evaluate the overall performance of a firm. A more specific approach was adopted by Luu et al. (2008), who applied BSC to design performance measures within a case study construction firm.

Professionals may face difficulties in designing a specific performance measurement system (PMS) within an organization during the PMS design phase (e.g., Neely et al. 1997, 2000), encounter political barriers and infrastructural barriers during the implementation phase (e.g., Bourne et al. 2000, 2002; Neely and Bourne 2000), and lack the capability to review and update the established PMS (Kennerley and Neely 2002, 2003). More importantly, they usually fail to select an appropriate conceptual model (Deng et al. 2012). For example, Deng et al.'s (2012) review found that several models had been applied in construction, such as BSC (e.g., Kagioglou et al. 2001; Yu et al. 2007), EFQM (e.g., Bassioni et al. 2005; Beatham et al. 2005), Service Quality Scale (e.g., Arditi and Lee 2003), and the Malcolm Baldrige National Quality Award model (e.g., Arditi and Lee 2003), while other models, such as the Performance Prism (Neely et al. 2001, 2002), do have potential in the construction context.

It is therefore unwise to conclude that there exists a best model for construction firms. Instead, it is better to revise some existing conceptual models to make them more suited to the characteristics of the construction industry. An examination of all candidate models is beyond the scope of this paper, although a justification of the one selected in this study (i.e., BSC) is warranted. That is, as reviewed earlier, the BSC model has a significant presence in the construction management literature. Its popularity, both in general and in the construction industry, provides a good basis for its application, and thus it is selected as a fundamental model in this research. The following section briefly reviews the BSC in terms of its theoretical foundations, strengths, and relevant criticisms.

Appraising the BSC Approach

The BSC, first developed by Kaplan and Norton in 1992, is described by the *Harvard Business Review* as one of the most influential business ideas of the past 75 years and was estimated to be used by 40% of the Fortune 1,000 companies at the end of 2001 (Marr and Schiuma 2003). It was designed to comprehensively measure firm performance, balancing between financial and nonfinancial perspectives. Having noted that traditional financial measures are "out of step with the skills and competencies

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companies are seeking to master today" (p. 71), Kaplan and Norton (1992) developed the BSC approach in response. This contains four perspectives:

1. Financial measures: how do we look to shareholders?
2. Customer satisfaction: how do customers see us?
3. Internal processes: what must we excel at?
4. Learning and growth: can we continue to improve and create value?

Consequently, it is assumed that the four perspectives are linked on a cause-effect basis, recognized as an essential aspect of the BSC, with vision and strategy always being at the heart of the four perspectives. Specifically, learning and growth 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. Kaplan and Norton's subsequent work largely improved the theoretical foundation and applicability of the BSC (Kaplan 2008; Kaplan and Norton 1993, 1996a, b, c, 2000, 2001) to exempt their model from serious criticism and create its current worldwide popularity.

Although the BSC has been widely applied to measure an organization's performance, its impact on financial performance is mixed (Banker et al. 2000; Braam and Nijssen 2004; Neely 2008; Olson and Slater 2002). Olson and Slater (2002) find that successful implementation of the BSC is highly linked to its impact on financial performance, while its weakness in practice is criticized by researchers (Neely and Bourne 2000; Norreklit 2000). Banker et al.'s (2004) statistical results show that the influence of the BSC on financial performance depends very much on whether it is linked to a firm's strategies. A 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. More recent quasi-experimental research by Neely (2008), however, did not find any positive association between the implementation of the BSC and financial outcomes.

The popularity of the BSC has also spread to the construction industry, reflected in the 2005 figure of 24.5% of surveyed construction engineering firms having adopted the BSC in the UK (Robinson et al. 2005). The BSC is widely applied in designing PM frameworks (Bassioni et al. 2005; Kagioglou et al. 2001) and empirical measurement systems (Yu et al. 2007), conducting case studies for measuring strategic performance (Luu et al. 2008a), and quantifying a firm's performance when investigating performance discrepancies (Kim and Arditi 2010b). In the construction industry, the main criticism of the BSC in practice is the absence of some critical dimensions, such as project management and supplier performance (Bassioni et al. 2005; Kagioglou et al. 2001). However, the fundamental philosophy of the BSC pertains to any industry (e.g., construction industry), i.e., challenging the traditional approach of merely focusing on financial performance of firms. Specifically, the main strengths of the BSC include the following ones:

1. It integrates four important performance perspectives in one simple and easy-to-use management report (Ghalayini and Noble 1996; Neely et al. 2000).
2. It explicitly highlights causality, which makes the PMS a feedforward control system (de Haas and Kleingeld 1999).
3. The linkage between PMs and firm strategies makes BSC a strategy control system, which is a weak area of many organizations (Otley 1999).
4. It contains both outcome dimensions and the driver of the outcome dimensions (de Haas and Kleingeld 1999; Norreklit 2000; Otley 1999).

These strengths facilitate the application of BSC in the construction industry (e.g., Kagioglou et al. 2001; Kim and Arditi 2010a; Luu et al. 2008a; Mohamed 2003; Yu et al. 2007) and also provide the theoretical underpinnings for this study.

Knowledge Gap

A review of the literature indicates that internationalization is an important research area in the construction industry. Index systems have been used to evaluate the degree of internationalization involved (e.g., Low and Jiang 2003, 2004), which is reflected in the international expansion of construction firms. Research has also identified the determinants of the success of construction firms in the international construction market. Further, previous research focused on the overall performance of construction firms, which plays an indispensable role in monitoring processes, measuring/evaluating performance, identifying whether strategies are aligned appropriately and successfully realized, and influencing organizational/personal behavior to add value to projects, organizations, and stakeholders, even though these characteristics are not yet completely understood in the construction context.

Nevertheless, international performance is derived from the process of international expansion in addition to the support that construction firms gain from the domestic market and is quite different from domestic performance. The difference between the construction industry's international and domestic markets is mainly attributable to culture, the economic environment, market regulations and financial institutions, and market entry barriers. These significantly affect the performance of construction firms and their execution of projects in the international market, which are politically, economically, and socially different from domestic construction projects. On the other hand, the dynamic relationship between domestic and international businesses should not be overlooked when measuring the performance of ICFs. For most ICFs, success in, and support from, the domestic market is also essential for overall performance. The existing literature reviewed previously comprises two distinct areas: performance measurement in construction (mainly focusing on domestic businesses) and internationalization in construction (mainly focusing on international businesses). The performance of ICFs is defined neither by the success of the internationalization process nor by success in completing international construction projects. Instead, it is concerned with how domestic support and international businesses together contribute to the sustained performance of the whole company, i.e., embedding international construction performance as an entity into the entire PMS. However, no research has yet been conducted to measure the performance of ICFs covering international businesses and domestic support.

Given the foregoing discussion, therefore, this study attempts to fill this knowledge gap by designing a practical framework to evaluate the performance of ICFs.

Research Methods

The study was conducted in three steps: (1) designing the framework, (2) weighting the framework and assessment methods, and (3) presenting a case study as follows (Fig. 1). The specific methods used include a literature review, group discussion (interviews and seminar), a questionnaire survey, and a case study.

Step I. Development of the Measurement Framework

The BSC approach was first adopted and then redesigned in a revised framework for evaluating the performance of ICFs. Specifically, this study follows that of Kaplan and Norton (1992) in adopting the four dimensions of financial, customer, internal business

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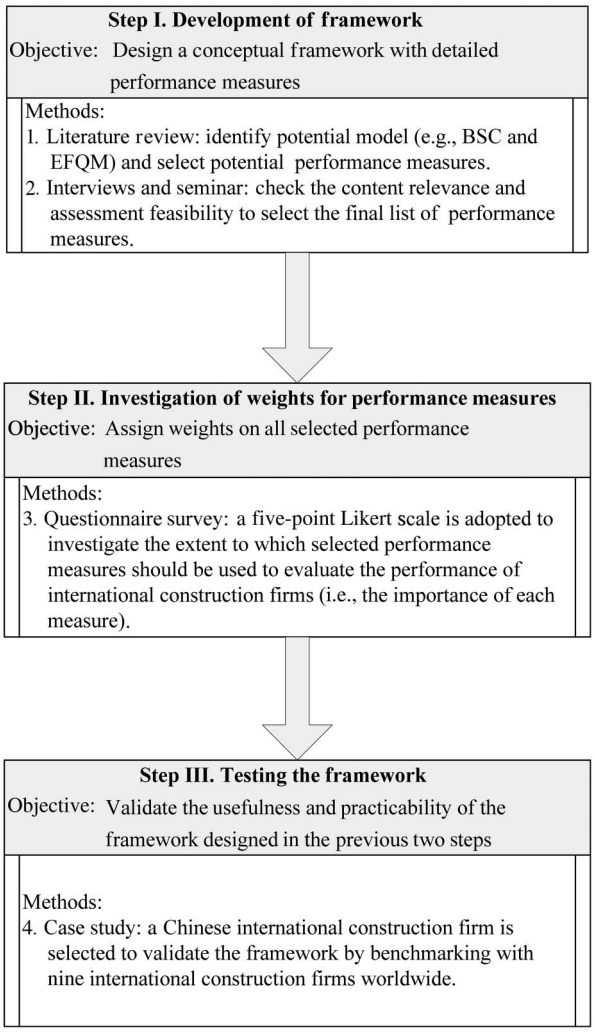

Fig. 1. Three-step research design

processes, and learning and growth to evaluate the international performance of contractors. Moreover, the two dimensions of market and stakeholders are added to the general BSC model. This makes the revised model more appropriate and applicable because market expansion and realization of value to stakeholders are of vital importance (Love and Holt 2000; Neely et al. 2002; Yee and Cheah 2006b).

When the conceptual dimensions of the performance of ICFs were determined, a literature review and interviews were applied to select potential performance indicators. Some indicators were selected directly from the literature, especially financial indicators. However, because measures related to international construction performance are limited and most existing measures in the literature are used for general performance measurement or project performance measurement, face-to-face or telephone interviews were then conducted with academics to collect their opinions on this arena. A total of 22 academics in Hong Kong and Mainland China were interviewed because of their research experience in the field of international construction. Of these, six interviewees hold professorships and the others have at least 5 years of research experience in international construction. A total of 36 indicators were identified after the literature review and interviews with academics (Table 1).

Regarding whether these 36 indicators make sense for practitioners, focus discussions were then applied. Specifically, two seminars (in Hong Kong and Beijing) were organized to discuss the practicality and appropriateness of these potential indicators. People with at least 15 years of working experience overseas were invited, and 37 international construction practitioners participated in these two seminars. Seventy-six percent of them were project managers or senior engineers, and 32% of them worked on building projects (see Table 2 for details of their profile). Finally, 27 indicators were selected for measuring the performance of ICFs, while others were excluded because more than half of the participants rejected them.

Step II. Investigation of Weights for Performance Measures

Empirical investigation of the different priorities in each performance indicator was needed in order to evaluate the overall performance of ICFs. Doing this involved providing a composite indicator of all six performance dimensions using the framework developed in Step I. The importance of each measure was determined because different measures might be viewed with different degrees of importance in practice. A self-administered questionnaire survey was therefore conducted to investigate the importance of these selected measures in practice. This involved the use of a five-point Likert scale (1 – very unimportant to 5 – very important). A self-administered survey provides a reasonable response rate but hampers the generalizability of results. However, considering that the nature of the research was to design a robust framework for evaluating the performance of ICFs rather than understanding the significance of single measures, the approach was regarded as reasonable.

A total of 200 questionnaires were sent to senior professionals (including the 37 participants in seminars during Step I) selected by e-mail from the participants of two international conferences. They had taken part in international practices and high-level business management for more than 10 years for worldwide mega international contractors involving different types of construction work. Of these, 47 valid responses were returned (see Table 2 for details of their profile) – a response rate of 23.5%, which is typical for this kind of research in the construction industry. Cronbach's α was applied to assess the internal reliability (Cronbach 1951).

Step III. Testing the Framework

A case study approach was used for two reasons. First, it provided a practical way for interested practitioners to apply the framework. Second, any practical issues encountered in a real evaluation situation enables recommendations to be made for revising the framework to make it more practical and applicable. In the case study, a benchmarking approach was adopted to compare the case study firm with its international counterparts. The international performance of nine top ICFs was simultaneously evaluated to provide external benchmarks for the case study firm, and the benchmarking results were used to formulate related internationalization strategies. To ensure the accuracy of the evaluation, the performances of the 10 firms (1 case study firm and 9 benchmarking firms) were evaluated separately.

Development of Measurement Framework

The logic underlying the BSC is that innovation and growth spur new processes and technologies that decrease costs and increase efficiencies from an internal business perspective (Kaplan and Norton 1992, 1996c). This, in turn, provides more value, and

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Table 1. Performance Indicators after Literature Review and Interviews with Academics (36)

Performance indicators	Sources
Section A – Financial (8)	
Turnover of total assets	These measures are commonly quoted in financial textbooks, e.g., Parker (2007).
Return on equity	They are also widely used by construction management researchers, such as
Revenue[a]	Balatbat et al. (2010), Kagioglou et al. (2001), Bassioni et al. (2005), Robinson et al. (2005),
Growth rate of revenue	Yu et al. (2007), El-Mashaleh et al. (2007), Luu et al. (2008a), Horta et al. (2010), Kim and
Operating profit	Arditi (2010a), CBPP (2000), and Tsolas (2011)
Profit rate[a]	
Growth rate of operating profit[a]	
Per-capita sales	
Section B – Market (5)	
The number of dominant markets	These measures are derived from the international construction (performance and strategy)
Growth rate of revenue in existing markets[a]	literature, including Yee and Cheah (2006a, b), Low et al. (2004), Han et al. (2010), and
The proportion of overseas income	Jung et al. (2012); this dimension mainly focuses on how a construction firm's businesses
The number of operating countries	are diversified in various international markets
Growth rate of overseas income	
Section C – Customer (4)	
Value realization of customers	Horta et al. (2010), Bassioni et al. (2005), Nudurupati et al. (2007), others
Customer satisfaction[a]	CBPP (2000), Kagioglou et al. (2001), Horta et al. (2010), others
The proportion of regular customers	El-Mashaleh et al. (2007)
Cooperation with customers	Interviews with academics; see also Horta et al. (2010) for customer cooperation
Section D – Stakeholders (4)	
Sustainable capacity	CBPP (2000)
Social responsibility	Interviews with academics; see also Bassioni et al. (2005)
International reputation of brand	Interviews with academics
Litigation or arbitration experience[a]	Interviews with academics; see also Toor and Ogunlana (2010) for the indicator "construction aggregation, conflicts and disputes"
Section E – Internal Business Processes (7)	
Number of core businesses	Han et al. (2010) and Yee and Cheah (2006a) for product diversification
Average profit rate	Yu et al. (2007), El-Mashaleh et al. (2007), Luu et al. (2008a), others
Proportion of profit from construction	Han et al. (2010) and Yee and Cheah (2006a) for product diversification
Number of internationally competitive businesses	Han et al. (2010) and Yee and Cheah (2006a) for product diversification
Coordination and integration of businesses	Interviews with academics; see also Bassioni et al. (2005) for process management
Supply chain management	Interviews with academics; see also Bassioni et al. (2005) for supplier management
Growth of business areas[a]	Interviews with academics
Section F – Learning and Growth (8)	
Efficiency of R&D input and output	Kim and Arditi (2010a), Chiesa et al. (2009), Yu et al. (2007), others
Application of IT	Yu et al. (2007), Luu et al. (2008a), El-Mashaleh et al. (2006), others
Competitiveness of IT[a]	Interviews with academics; see also Kim and Arditi (2010a) and Bassioni et al. (2005)
Employee satisfaction	CBPP (2000), Luu et al. (2008a), Kagioglou et al. (2001), Bassioni et al. (2005)
Brain drain[a]	CBPP (2000)
Investment in training	CBPP (2000), Kagioglou et al. (2001), Bassioni et al. (2005), others
Organization and management efficiency	Bassioni et al. (2005), Horta et al. (2010), Kim and Arditi (2010a), others
Knowledge and information sharing	Bassioni et al. (2005), Kim and Arditi (2010a), others

Note: Numbers in parentheses denote number of indicators under each dimension.
[a]Indicator excluded after focus discussions (seminar) with experienced professionals.

Table 2. Profile of Participants (Step I), Respondents (Step II), and Interviewees (Step III)

	Step I: seminar participants		Step II: questionnaire respondents		Step III: interviewees from case firm	
Characteristics	Number	%	Number	%	Number	%
Job position						
Senior engineer	13	35	11	23	13	37
Project manager	15	41	18	38	14	40
Corporate department head	6	16	13	28	5	14
Corporate director or executive	3	8	5	11	3	9
Total	37	100	47	100	35	100
Professional background						
Building	12	32	15	32	20	57
Transportation	9	24	11	23	9	26
Industrial	5	14	6	13	2	6
Water	4	11	5	11	1	3
Waste	3	8	6	13	1	3
Power	4	11	4	9	2	6
Total	37	100	47	100	35	100

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therefore satisfaction, to the customer and, hence, improved financial results. Although the extent to which learning and innovation can take place is problematic in the construction industry due to its fragmented nature, at the company level it can reflect a capability for integrating knowledge and innovating in one of the lesser innovative industries.

Further, the construction industry is also characterized as one in which various stakeholders with quite different business objectives are involved in the construction process. The customer perspective of the BSC is insufficient to capture these characteristics of the construction industry. Love and Holt's (2000) stakeholder perspective measurement (SPM) emphasizes the need to dynamically and progressively embrace all stakeholders' interests, including those of customers. Generally, PM in construction is client-driven, while customer satisfaction mainly relies on the completion of projects on time, within budget, and with satisfactory quality. In this respect, other stakeholder concerns (such as sustainability, reputation, and social responsibility) are often overlooked by construction organizations. An improvement in these aspects should benefit customers, but, more importantly, they are closely aligned with the interests of other stakeholders. Given this, the stakeholder perspective (focusing on sustainability, reputation, and social responsibility) is critical in understanding the construction business and is also essential for construction firms in understanding their critical stakeholders (*cf.* Atkinson et al. 1997; Neely et al. 2002). This dimension essentially complements the customer perspective in the BSC and enhances its applicability in the context of construction.

In addition, market performance is a unique dimension for measuring the overall performance of ICFs. This is largely related to other two dimensions in the BSC—financial performance and customer perspective—and thus an explanation of the uniqueness of the market performance dimension is necessary. First, market performance, such as market share, is a nonfinancial indicator rather than a financial outcome (Franco-Santos 2007). Second, market performance (e.g., market share) does not sufficiently result in financial outcomes (Norreklit 2000). Third, including market performance as part of the customer perspective is inappropriate in construction, particularly in the international construction context. Market share, for example, is usually considered an aspect of customer perspective (Kaplan and Norton 1996b) and regarded as the outcome of customer satisfaction and retention. However, this can be misleading in the construction industry due to its low market concentration ratio (large number of small and medium-sized contractors). Instead, focus on the success of market and product diversification in the construction industry is more concerned with market performance. Since diversification has become an important strategy for ICFs (Han et al. 2010; Jung et al. 2012; Yee and Cheah 2006a, b), it is crucial to measure how successful construction firms compete with their counterparts by providing diverse services and entering into new (emerging) markets. Certainly, this complements the financial perspective, which constitutes the ultimate rational objective of firms—to gain sustained monetary gains in the long term.

Hence, the final framework consists of the six dimensions of financial, market, customer, stakeholders, internal business, and learning and growth as follows:

1. Establishing financial goals is the first step toward using the BSC model and is also the basis for benchmarking externally. Apart from traditional financial measures (such as return on net assets, cash flow, and profitability), sustained growth of existing income and increased profit from the international market are critical aspects and ultimately have a direct positive effect on performance.
2. Expanding the international construction market reflects construction firms' capabilities in winning and operating construction projects worldwide. In fact, their international construction performance is directly reflected by overseas income. The expansion of the international construction market can mitigate the business risk of domestic construction market fluctuations and recession. Explicitly, contractors can achieve better financial performance by enhancing international revenue and realize the transference of the relative advantages of technology and capital resources between different international construction markets (Kim and Reinschmidt 2011; Yee and Cheah 2006b).
3. Enhancing customer value leads to close customer relationships and high-quality operations, especially in the construction industry. This can be achieved by providing an integrated engineering project solution such as by (a) strengthening the consulting business, providing high-quality professional consulting services so as to improve customer satisfaction and paving the way for the acquisition of further construction work; (b) maintaining high-quality standards of construction services, providing more reliable products and services so as to further improve the image of the firm; and (c) enhancing operations management, making full use of established standards, and shortening service response times so as to enhance customer satisfaction and reduce customer complaints.
4. Focusing on stakeholders is important for construction firms in order to achieve sustained performance and success. This is more critical for those striving to compete in the international construction market, where a wide variety of stakeholders with different objectives are involved. Because construction projects generally involve a large amount of capital and a large number of stakeholders (e.g., end users, developers, sponsors or investors, various institutions, and local governments), some stakeholders, such as end users, can be overlooked, which can lead to higher operational costs. Therefore, construction firms, as important participants, should consider the interests of end users and final operational costs during the construction process because this enhances their reputation and adds to their market value.
5. Integrating internal business processes refers to the capability of firms to translate intangible resources into tangible results. This involves the adoption of (a) continuing business innovation, (b) enhancing operational efficiency, (c) expanding finance channels and improving cost-control strategies, (d) guaranteeing quality and safety, and (e) insisting on technological innovation.
6. Enhancing learning capacity to support the implementation of strategies is traditionally a weak area for construction firms due to the project-based nature of their business, which necessitates temporary project management teams, but is nevertheless important in producing a sustained international performance. The ability to learn and innovate is the basis for improved operational efficiency, benefits shareholders, customers, and other stakeholders, and is derived from the intangible assets of enterprises (human, information, and organizational capital).

In sum, therefore, in a similar manner to the causal premise of the BSC, the framework implies that learning and growth contribute to improving the internal efficiency of business processes, which in turn benefits the firm in satisfying its customers and stakeholders. Consequently, satisfied customers and stakeholders result in a higher market performance and a more competitive role in the international construction market, so that the firm can reap the financial benefits needed to maintain long-term sustained success. The six dimensions of the framework and detailed measures of the performance of ICFs are presented in Table 3.

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Table 3. Selected Indicators for Measuring Performance of ICFs

Dimension	Number	Performance measure	Definition and metric
Financial performance	F-1	Total asset turnover	Total asset turnover = total revenue/total asset
	F-2	Return on equity	ROE = (net profit − preferred stock dividend)/(shareholder 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 performance	M-1	Number of dominant markets	Number of countries or regional markets where the enterprise has become the main contractor or at least among top 10
	M-2	Ratio of overseas income	Ratio = overseas income/total income
	M-3	Number of operating countries	Number of countries and regions entered (including all kinds of entry mode)
	M-4	Growth rate of overseas income	Growth rate of overseas operating income
Customer perspective	C-1	Value realization of customers	E.g., overall satisfaction with services, including project function, quality, safety, budget, time of delivery
	C-2	Proportion of regular customers	Proportion of sales from regular customers (those who have made more than one deal with firm)
	C-3	Cooperation with customers	Cooperative relationships with customers, e.g., strategic partnering, ancillary services
Stakeholders	S-1	Sustainable capacity	Implementation of sustainable initiatives to improve efficiency and add value for end user
	S-2	Social responsibility	Social responsibility in project development, such as in environmental protection and energy savings
	S-3	International reputation of brand	International reputation, user reputation, brand value, and positive reports
Internal business processes	I-1	Number of core businesses	Number of core businesses, with construction business calculated according to nine broad categories
	I-2	Average profit rate	Average profit margin of core businesses
	I-3	Proportion of profit from construction business	Proportion of profit from construction in all business (to reflect degree of business integration)
	I-4	Number of internationally competitive businesses	Number of businesses in which income ranks in top 10 ENR 225
	I-5	Coordination and integration of business	Coordination and complementarity of all businesses (to improve competitiveness)
	I-6	Supply chain	Efficiency and integration of supply chain
Learning and growth	L-1	Efficiency of research and development (R&D) input and output	Input of resources in R&D and efficiency of output
	L-2	Application of IT	Advantage and integration of IT development, such as ERP, OA, CRM, HRM, SCM
	L-3	Employee satisfaction	Including responsibilities, scope of authority, fair opportunities, training, career planning, and remuneration
	L-4	Organization and management efficiency	Leader's incentive and drive for organizational teamwork and diversity and cohesion of enterprise culture
	L-5	Knowledge and information sharing	Capacity and efficiency of internal knowledge and information sharing

Note: ERP = enterprise resources planning; OA = office automation; CRM = customer relationship management; HRM = human resource management; SCM = supply chain management.

The following rules apply when using the framework:

1. To reflect the real situation of the firm and reduce any adverse effects caused by data fluctuations, the quantitative indicator values are based on the average of three consecutive financial years.
2. Qualitative indicators are evaluated according to five grades: excellent, very good, good, medium, and poor, scored from 5 to 1, respectively.
3. To reflect their priority, weights are assigned to the indicators based on a questionnaire survey (results of Step II), with

$$w_{ij} = \frac{M_{ij}}{\sum_{i=1}^{m} M_{ij}} \tag{1}$$

where w_{ij} = weight of measure i under dimension j; M_{ij} = mean importance score of measure i under dimension j; and m = number of measures for each dimension.

4. To ensure comparability among the different indicators, their values are finally converted into a five-point scale by the method of dimensionless conversion. Calculation of the final performance score of ICFs is based on

$$P_{\text{overall}} = \sum_{j=1}^{6} w_j \cdot D_j \tag{2}$$

$$D_j = 5 \sum_{i=1}^{m} w_{ij} \cdot \frac{d_{ij} - \min}{\max - \min} \tag{3}$$

$$w_j = \frac{\overline{M_j}}{\sum_{j=1}^{6} \overline{M_j}} \tag{4}$$

$$\overline{M_j} = \frac{\sum_{i=1}^{m} M_{ij}}{m} \tag{5}$$

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where $P_{overall}$ = overall performance of ICFs; D_j = performance value of dimension j; w_j = weight of dimension j; d_{ij} = performance value of measure i under the dimension j; $\overline{M_j}$ = mean importance score of dimension j; max = maximum performance value of measure i among evaluated firms; min = minimum performance value of measure i among evaluated firms; and m = number of performance indicators for the associated dimension.

Investigation of Weights for Performance Measures

The weights are obtained by calculating the mean score of single measures (Table 4), with the weights of the six dimensions being based on the mean value of their associated measures. Cronbach's α is used to assess the internal reliability of the different measures for each dimension. The result shows that the internal reliability of the six dimensions of the framework is generally reasonable, with four obtaining a satisfactory score ($\alpha > 0.7$, a conventional cutoff) (Nunnally 1967). Learning and growth has the highest internal reliability ($\alpha = 0.866$), followed by financial performance ($\alpha = 0.738$), market ($\alpha = 0.735$), and internal business ($\alpha = 0.772$). In addition, customers ($\alpha = 0.649$) and stakeholders ($\alpha = 0.604$) with α scores higher than 0.6 are also regarded as acceptable (Hair et al. 1998). This result indicates that calculating the collective importance of each dimension does not cause significant bias.

From the view of practitioners in the construction industry, the concern on stakeholders is the most important aspect of the performance of ICFs, closely followed by learning and growth and customers' perspective. This result indicates that achieving excellence in sustainability, social responsibility and international reputation is regarded as the most important way to gain a sustained competitive advantage in the construction market. Specifically, an international reputation is rated as the most important among all selected indicators, with a score of 4.30. In the meantime, proactive sustainability and social responsibility agendas would help ICFs gain an international reputation. Hence, measuring these leading indicators becomes an essential step to accurately maintain continuous focus on stakeholders.

Although construction management researchers believe that learning and growth is difficult to achieve due to the unique nature of construction projects, it is highly regarded by the respondents, with an average score of 3.95. This can be partly explained by the low base of learning and innovation practices in the construction industry. That construction is usually characterized as a conservative rather than innovative industry has gained increasing attention, and continuous learning and growth has been highlighted in various industry reports as an opportunity for construction improvement. This is confirmed in the present research, where learning and innovation is seen to be increasingly and explicitly important in the construction context despite the existence of many industry-characterized obstacles, such as the fragmented nature of the main participants.

Table 4. Weights and Assessment Tools of Selected Indicators

Number	Performance measure	Mean	Standard deviation	Weights	Assessment tool	
					Method	Unit
Financial performance (Cronbach's $\alpha = 0.738$)		3.72	0.72	0.16		
F-1	Total asset 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 performance (Cronbach's $\alpha = 0.735$)		3.39	0.86	0.15		
M-1	Number of dominant markets	3.49	1.20	0.26	AD	E
M-2	Proportion of overseas income	3.47	1.14	0.26	AD	%
M-3	Number of countries operating in	3.19	1.06	0.24	AD	E
M-4	Growth rate of overseas income	3.40	1.19	0.25	AD	%
Customer perspective (Cronbach's $\alpha = 0.649$)		3.93	0.75	0.17		
C-1	Value realization of customers	4.00	1.00	0.34	EA	S
C-2	Proportion of regular customers	3.66	1.01	0.31	AD	%
C-3	Cooperation with customers	4.13	0.95	0.35	EA	S
Stakeholders (Cronbach's $\alpha = 0.604$)		4.02	0.71	0.18		
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 processes (Cronbach's $\alpha = 0.772$)		3.78	0.68	0.17		
I-1	Number of core businesses	3.70	1.00	0.16	AD	E
I-2	Average profit margin	3.77	1.03	0.17	AD	%
I-3	Proportion of profit from construction business	3.85	1.02	0.17	AD	%
I-4	Number of businesses with international competitiveness	3.81	0.97	0.17	AD	E
I-5	Coordination and integration of business	3.62	0.90	0.16	EA	S
I-6	Supply chain	3.94	1.03	0.17	EA	S
Learning and growth (Cronbach's $\alpha = 0.866$)		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	Employee satisfaction	4.00	0.96	0.20	EA	S
L-4	Organization and management efficiency	4.21	0.88	0.21	EA	S
L-5	Sharing of knowledge and information	3.83	1.13	0.19	EA	S

Note: $N = 47$; AD = archival data derived from corporate reports and third-party data sources; EA = expert assessment of measures based on comprehensive understanding of target construction firms; $ = US dollars; E = each; S = scale 1–5.

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The construction industry is client-driven, and satisfying clients' requirements is a critical success factor for construction projects and organizations. However, the industry faces a situation where customers (both end users and clients) are generally dissatisfied (Egan 1998). The survey results indirectly confirmed this feature, with the customers receiving a high importance score of 3.93. Considering customer requirements, delivering value to the customer, and positively cooperating with customers are the main aspects of customer focus in this framework. In the international construction market, the means of satisfying customers is more complicated than that in the domestic market, as long-term relationship-based collaboration is much more difficult between construction firms and international clients in different cultural, political, and economic environments.

The importance scores of 3.72 and 3.78 for financial performance and internal business processes, respectively, are slightly lower, with the market perspective being much lower at only 3.39. This may be because market performance in international markets does not translate into financial performance as easily as in other industries, such as manufacturing, where market performance has a direct impact on economic performance. In fact, the low concentration ratio of the construction market indicates that market performance can hardly reflect the real situation of construction firms.

In sum, the result as discussed previously is highly consistent with the development of PM in general, i.e., leading measures (learning and innovation, stakeholders, and customers) are increasingly critical and useful for evaluating the performance of firms, while lagging measures (finance and markets) have shortcomings in terms of identifying problematic areas and, more importantly, why these areas are problematic.

Testing the Measurement Framework: A Case Study

Evaluation Process

A case study of a Chinese ICF was conducted to illustrate the use of the framework discussed in this article as a tool for evaluating its overall performance. The case firm (referred to here as CF-China) is one of the largest domestic and international construction enterprises in China, being consistently engaged in the construction business in more than 50 countries and areas worldwide. Nine top international contractors (BF-1–BF-9) were chosen to set external benchmarks. These were randomly selected from the *Engineering News-Record* (ENR) 225 Top 50 list of international contractors.

Quantitative data of these 10 companies were collected primarily from annual reports, official websites, and other sources (such as ENR). Evaluation of the intangible aspect of international construction performance is a difficult task, and thus three ways were adopted to minimize potential evaluation bias:

1. First, the academic experts interviewed in Step I were invited to rate the performance level of the best performer (based on their understanding and knowledge) in the construction industry on a five-point scale. A description of the evaluation standards was also provided. The result of this rating process is called the best-level performance.
2. Second, a total of 35 employees from various levels of the case study firm (CF-China) were interviewed and asked to comment on the performance of their company in terms of these intangible aspects (see Table 2 for details of their profile). The interview data were complemented by document analysis, and a score was then determined by the researchers.
3. Third, a document analysis of the nine benchmarking firms was made to obtain qualitative data of the benchmarking firms (BF-1–BF-9). The best-level performance rated by these experts was then used as a baseline for evaluating the subjective indicators of the benchmarking firms due to the difficulties involved in rating the subjective performance of the firms in the absence of in-depth interviews with employees. In this regard, when sufficient data were available, the performance level of these indicators was determined by the researchers. However, when insufficient data were available to clearly determine the performance level, the performance score was assumed to be equal to the best-level performance. An example of the measurement of the subjective indicators is provided in Table 5.

Evaluation Results

The evaluation results are shown in Table 6. To illustrate their interpretation concerning the case study firm, several conclusions follow:

Table 5. Example of Measuring Subjective Indicators Using Five-Point Scale (Indicator S-3: International Reputation of Brand)

Scale	Level	Defined evaluation standard	*(1)* Expert perception of best-level performance	*(2)* Researchers' evaluation of CF-China, based on interviews	*(3)* Researchers' evaluation of BF-1, based on document analysis and compared with *(1)*
5	Excellent	The company is well known, with a reputation in all subsectors in various countries or regions			
4	Very good	The company is well known, with a reputation in some subsectors in various countries or regions	x		x
3	Good	The company is well known, with a reputation in some subsectors in specific countries or regions			x
2	Medium	The company is well known, with a reputation in several subsectors in specific countries or regions		x	
1	Poor	The company is not well known in the international market			
Final score for CF-China and BF-1				2.0	3.5

Note: under *(3)* in far-right column, when it is hard to clearly identify the performance level of benchmarking firms based on available information, an approximate score is given. In this case, the performance level is between Levels 3 and 4, while the score of 3.5 was determined by the researcher as the performance level of the international reputation of the brand BF-1.

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1. Market development is weak. In terms of market development, the nine benchmark companies are involved in the main construction markets throughout the world, such as Europe, USA, Latin America, Asia, the Middle East, and Africa. They dominate these construction markets and have formed their own marketing networks. In comparison, CF-China mainly operates in Hong Kong and Macao and dominates the market in these two regions. However, its expansion to other overseas construction markets is very limited to date. Although it started this activity several years ago and won some construction contracts, it has not yet established a stable market network. Thus, there is a clear gap between CF-China and the benchmark firms in terms of market expansion and development, reflected in the fact that the values of all its measures of market dimensions were the lowest in comparison with its international competitors.
2. Financial performance is moderate. The financial performance of CF-China is average compared with other international contractors. This might be because the selected financial measures, such as return on assets and the rate of revenue growth, are related to firm size. Despite its encouraging financial performance, however, CF-China is still much lower than BF-1, indicating a clear gap in comparison with the best performer in the market.
3. Customer needs not being met. The performance of CF-China's customer dimension is lower than all the benchmark firms, indicating its failure in terms of meeting customer needs. This may be because CF-China aims to meet customer needs in the construction phase, rather than over the entire life cycle of projects. Although CF-China is well qualified to successfully complete projects in terms of quality, time, and budget, a large proportion of its construction contracts are won by price competition and incentives, which may have led to a neglect of customer loyalty and client relationships. This has resulted in a weakened international reputation, less trust from clients, and consequent loss of contracts. In contrast, the nine benchmarking firms generally have close relationships with their clients or customers, providing them with complete and integrated solutions to satisfy their needs. The provision of services covering the planning, design, construction, and operation phases of construction enable the top contractors to avoid low-price competition and therefore obtain substantial profits as well as improved customer loyalty and dependence.
4. A higher and more sustained international reputation is needed. The performance of the stakeholder dimension indicates a low international reputation in comparison with the benchmark firms. CF-China has worked hard to satisfy project end users (e.g., through energy savings, environmental protection, and corporate social responsibility), resulting in effectively meeting the demands of stakeholders, and thus the gap in these areas is very small. However, strategies are still needed to improve its international reputation.
5. An integrated supply chain is needed to achieve excellent internal business performance. The evaluation process indicates that the benchmarking firms have a common characteristic:

Table 6. Evaluation Results of Case Study Firm

Number	Performance measures	CF-China	BF-1	BF-2	BF-3	BF-4	BF-5	BF-6	BF-7	BF-8	BF-9
Financial performance		2.09	3.65	2.28	1.53	1.73	0.93	2.02	2.11	1.80	1.46
F-1	Total asset 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 (US$1,000,000)	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 (US$10,000)	29.18	22.97	85.34	21.69	20.00	7.65	52.19	150.50	151.90	77.80
Market performance		0.00	1.30	3.38	3.60	1.02	2.57	2.51	2.06	1.81	3.13
M-1	Number of dominant markets	3.50	5.00	5.00	6.00	4.00	5.00	4.00	6.00	6.00	7.00
M-2	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 countries operating in	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 perspective		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	Proportion of regular customers (%)	62.00	65.00	61.00	65.00	60.00	65.00	62.00	63.00	57.00	64.00
C-3	Cooperation with customers	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 processes		2.11	1.85	2.35	3.39	2.66	2.82	3.59	2.56	1.89	2.05
I-1	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	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	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 businesses 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 and integration of business	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 growth		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 and 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 and information	3.00	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

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their business covers the entire value chain of the construction industry through both the horizontal integration of construction-related businesses and vertical integration of upstream and downstream activities in the industrial chain. For example, most of these firms have businesses in various subindustries, such as housing construction, manufacturing, energy facilities, water conservation facilities, chemical industrial facilities, transport facilities, waste disposal, sewage treatment, and communications facilities. More importantly, while a large number of the businesses are ranked in the ENR 225 Top 10, only CF-China's housing construction business is ranked so highly. In terms of vertical expansion, most of the benchmarked firms have a market-leading position in the areas of construction consulting services, real estate development, infrastructure investment, and property and facilities management. This pushes them to become a supplier of integrated construction services, whereas CF-China, as a market follower, needs to enhance its expansion vertically and horizontally.

6. Greater investment in research and development (R&D) is needed. The evaluation of the performance of learning and innovation points to a considerable gap between CF-China and the benchmark firms. These latter have established a sound R&D management organization with a number of highly qualified R&D professionals, and they devote a great deal of resources to conducting research with associated universities and research institutions. Although it is hard to quantify the R&D output of these firms, the evaluation suggests that there is a consistent R&D effect on their operational capacity and competitive advantage. Additionally, the qualitative evaluation of other measures indicates the presence of a large gap between CF-China and the benchmark firms.
7. Overall international construction performance of CF-China is low. All the benchmark firms have a value higher than 2.50, with some even being above 3.00. In contrast, CF-China's result is 1.91, suggesting the need for CF-China to devise some additional internationalization strategies to narrow the gap with its competitors in the international construction market.

Discussions, Limitations, and Conclusions

Overall, evaluation of the performance of ICFs is urgently needed, especially in China, where many companies are striving to survive and struggling to compete with their strong and experienced counterparts from developed countries.

The practical application of conceptual frameworks such as BSC and EFQM is becoming increasingly popular in the construction industry, and a significant amount of research has been aimed at applying the BSC approach to measure the performance of construction firms. Previous research showed that the BSC approach was appropriate for construction firms but that it is necessary for some unique characteristics of the construction industry to be considered in order to make the BSC's application more effective and smoother (Bassioni et al. 2005; Kagioglou et al. 2001), For example, the inclusion of project management and supply chain issues demands that stakeholders and market factors be added to the BSC framework for it to be more appropriate for construction firms. In addition, the questionnaire survey of the senior managers of construction firms validated the internal relationships involved, while the content validity and assessment feasibility of the measures were previously eliminated by means of expert interviews and seminars. In terms of international construction performance, previous research focused more on the internationalization process rather than the overall performance of ICFs. As the present research shows, though, by concentrating on performance, a more comprehensive view is obtained that facilitates the identification of a firm's weak areas and main constraints on its internationalization activity and competitiveness in the international construction market. Therefore, the research makes two major contributions to the knowledge of PM, i.e., a significant extension to international construction performance evaluation and a new approach to revising the BSC for construction firms.

Measuring qualitative or intangible aspects of performance has become of significant interest in other industries, and now, through this research, its importance has been realized in the construction industry too. While still being consistent with the original BSC framework, where learning and growth, efficiency of internal business, and customers are critical foci needed to improve financial performance, measuring intangible aspects is also effective in identifying weak areas that hamper financial outcomes. However, measuring intangible aspects can be highly subjective and error prone in the absence of a robust measurement design, data collection, and analysis, which may be a difficult and time-consuming task for construction firms. Therefore, to eliminate the measurement bias of qualitative measures, selecting multiple benchmarking companies may be more reliable.

Of the research limitations, first, the development and selection of the measures under the six dimensions were based on expert interviews and professional seminars, and when applying the framework, these measures should be used as a reference and some appropriate adjustment for the measures needs to be made according to the firm's characteristics. For example, the study here was limited to evaluating the performance of ICFs, while some measures of adjustment may be needed for small and medium-sized specialist contractors. The second limitation is that the evaluation of qualitative measures requires considerable time and effort and may have a direct impact on the accuracy of evaluation results. Therefore, external institutions or assessors may be needed to evaluate these qualitative measures, as self-assessment could easily lead to a biased evaluation. Further, the case study mainly emphasized external evaluation and benchmarking, while a limited lesson is learned about how the proposed framework can be implemented in an organization and how contextual barriers/factors may constrain or facilitate the implementation processes. Thus, more research is needed to understand how it can be implemented, used, and updated successfully within a changing (organizational) environment. Finally, the applicability of the framework may be limited by the fact that the case company was a Chinese stated-owned enterprise (SOE). Performance measurement practices adopted by SOEs (or Chinese companies in general) may be different from those of other private or public companies in Western countries because institutional and cultural factors may have an impact on the development of their PMSs (Fleming et al. 2009; Li and Tang 2009). Investigating the relationship between institutional/organizational characteristics and PM practices therefore promises to be an important research area in the future.

In conclusion, it is believed that the framework discussed here has practical value for those firms striving to compete in the international construction market, and the case study showed its potential in terms of evaluating the performance of large ICFs and formulating internationally competitive strategies. Applying the framework to evaluate one of the largest construction firms in China revealed that its international construction performance was much lower than that of its competitors in several aspects, e.g., insufficient investment in R&D, weak integration of the value chain of construction services, failure to meet client needs, and an

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insufficient international reputation in the construction market, which provide a rational basis for decision making with respect to international expansion. These weaknesses may well be common for the majority of Chinese construction firms because most of them compete at a similar level due to their similar size, organizational capabilities, and constraints on international development and expansion (*cf.* Wang 2004). This being the case, then what the research results point to here is the need for Chinese construction firms to adopt diversified strategies for sustained performance and success in the future.

The principal contribution of this paper is that a practical framework (a revised BSC with 27 detailed performance measures) is designed for professionals to evaluate the performance of ICFs. This extends the knowledge of PM to the international arena and enriches the literature on PM at the firm level, where more research is still needed.

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