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Contractor Key Competitiveness Indicators (KCIs): a Hong Kong Study

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ABSTRACT

Proper understanding on competitiveness indicators is important for assisting contractors to formulate effective competition strategies and for assisting clients to select suitable contractors. This study presents a list of competitiveness indicators for measuring contractor competitiveness with reference to Hong Kong construction industry. Contractor Key Competitiveness Indicators (KCIs) adopted in the local practice are identified. This identification was conducted through analyzing the data collected from a comprehensive questionnaire survey in the local industry. Relative Importance Value (RIV) was used as the criterion for the identification of the KCIs. The findings from this study provide valuable information for helping contractors from different backgrounds in the local construction market to understand their competitive advantages and weaknesses, thus relevant actions can be taken for improving their competitiveness. The research also provides valuable references for investigating contractor KCIs in different construction practices.

KEYWORDS

Key Competitiveness Indicators (KCIs)
Contractor
Competition Strategy
Relative Importance Value
Hong Kong Construction Industry

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INTRODUCTION

Understanding and improving the competitiveness of organizations has been a popular research area. Factors affecting organizational competitiveness have close association with the structure and practice of an industry. Studies on competitiveness and competitive advantage have been conducted by many researchers (Porter, 1985; Pettigrew, 1988; Betts and Ofori, 1992; Hu, 2001; Hitchens et al., 2003). Porter (1980) suggested five major forces determining the competition practice within an industry, namely, industry competitors, potential entrants, suppliers, buyers and substitutes. In construction industry, competitiveness is generally used for ranking contractors in a bidding process. Previous studies have presented several methods for assessing contractor competitiveness in pre-qualifying and short-listing tenders. The study by Flanagan and Norman (1982), for example, suggests measuring a bidder's competitiveness by the bidder's previous success rate, which is calculated by a percentage of the bidder's successful contract value to its total bids within a certain period. Drew and Skitmore (1993) defined contractor bidding competitiveness as a percentage of the difference between concerned contractor's bid and the lowest bid among all bidders to the lowest bid. Shen et al. (1999) developed an optimal bid model to help contractor in determining an optimal level of tender price and contract time in order to maximize its overall competitiveness.

In a more recent study, Li et al. (2002) introduced a multi-level parameter model for accessing contractor's competitiveness after analyzing the construction business environment in China. Based on the study by Li et al. (2002), Shen et al. (2003) developed a Windows-standard Decision Support System Contractor's Competitiveness Assessment Scoring System (C-CASS) for assessing contractors' total competitiveness value. In a further study, Shen et al. (2004) identified the model adopted to award construction contracts on multi-criteria basis in China by taking into account both the contractor's competitiveness and the defined project objectives. This model presented a comprehensive list of competitiveness parameters.

As an extension to the study by Shen et al. (2004), this paper aims to find out the key competitiveness indicators (KCIs) for measuring contractors' competitiveness in the Hong Kong construction industry. An index value is used for measuring the significance of individual competitiveness indicators, by which the KCIs are to be identified. Data used in the analysis were collected through a survey to the construction industry in Hong Kong. The research results provide insights into the practice of what affecting contractors' competitiveness in the Hong Kong construction market. The identified KCIs will be useful to help contractors to understand their strengths and weaknesses, thus improve the effectiveness of formulating competitive strategies in competitions. As the practice of the Hong Kong construction industry is well developed, the research findings are valuable references for those construction industries in developing countries and regions. They are also valuable research references for examining competition practice in other construction industries.

CONTRACTOR COMPETITIVENESS INDICATORS

The identification of contractor competitiveness indicators has been extensively examined in previous studies. For example, the study by Holt et al. (1994) classifies competitiveness indicators under five groups: contractor's organization, financial considerations, management resource, past experience, and past performance. Each group includes various specific indicators. Hatush and Skitmore (1997) proposed a set of alternative criteria classified into five categories for assessing contractor competitiveness, including financial

soundness, technical ability, management capability, health and safety, and reputation. Nevertheless, these works are criticized, for example, for lacking consistency. The study by Lam et al. (2000) presents an artificial neural network as a decision support tool for pre-qualifying contractors through examination of the multiple contractor competitiveness variables including technical strength, financial status, etc. A recent study by Shen et al. (2003) presents a more comprehensive set of contractor competitiveness indicators in the development of a model for calculating a contractor's total competitiveness value (TCV). TCV model incorporates contractor competitiveness indicators classified under six categories, namely, social influence, technical ability, financing ability and accounting status, marketing ability, management skills, and organizational structure and operations.

The examination on the existing studies leads to the formulation of an alternative list of competitiveness indicators, as presented in Table 1. The validity of the list for application in Hong Kong construction industry was tested through a number of selected professional interviews in the local construction industry. Valuable comments and suggestions were contributed by the interviewees, based on which modification was made to the list. The interviews helped in improving the clarity and readability of the indicators.

Table 1 Preliminary List of Indicators for Measuring Contractors' Competitiveness

Section I : Indicators Measuring Corporate Image	
I-1	Recognized grading for company (e.g., Category A, B, or C)
I-2	Professional qualifications of project manager
I-3	Business coverage & market share (by region)
I-4	Business coverage & market share (by industrial sectors)
I-5	Business specialism (design, or construction, etc.)
I-6	Organizationn's credibility
I-7	Bank credibility rating
I-8	Project quality awards
I-9	Project safety performance records
I-10	Project environment & hygiene performance records
I-11	Corporate identity
I-12	Compatible with the local culture
I-13	Social conscience and responsibility
Section II : Indicators Measuring Technical Ability	
I-14	Capacity of construction equipment and plant
I-15	Capacity of construction equipment and plant per staff
I-16	Proportion of advanced construction equipment and plant
I-17	Utilization efficiency of equipment and plant
I-18	Equipment/plant depreciation rate
I-19	Establishment of research unit and strength of research staff
I-20	Level of investment on Research & Development
I-21	The rate of applying the new technology developed internally
I-22	Level of external dissemination of the new technology

Table 1 Preliminary List of Indicators for Measuring Contractors' Competitiveness (continued)

Section II : Indicators Measuring Technical Ability (continued)	
I-23	Number of the technical patents owned by the organization
I-24	Number of technical patent transfers
I-25	Number of professional staff
I-26	Number of technical staff
I-27	Adequacy of administrative staff
I-28	Standing of technology advancement within the industry
I-29	Extent of applying information technology
I-30	Conversant with the local practice
Section III : Indicators Measuring Financing Ability	
I-31	Credibility grade certified by relevant financial bodies
I-32	The value of annual loans obtained
I-33	Knowledge about financial policy
I-34	Effectiveness of communication with banker and financial institutions
I-35	Organizational assets status
I-36	Organizational profit status
I-37	Organizational debt status
I-38	Growth rate of the organizational total assets
I-39	Growth rate of the organizational profit
I-40	Growth rate of gross output
I-41	Capability of loan repayment
I-42	Payment to subcontractors / suppliers on time
Section IV : Indicators Measuring Marketing Ability	
I-43	Geographical regions of business activities
I-44	Scope of business activities
I-45	Ability and facilities for managing market information
I-46	Ability to forecast the changes of market conditions
I-47	Past success rate in pre-qualification exercises
I-48	Past success rate in the final bidding stage
I-49	Value of annual contract works
I-50	Membership in relevant government advisory committees
I-51	Relationship with governmental departments
I-52	Relationship with private sector developers
I-53	On the tender list for governmental works
I-54	On the tender list for private sector developers
I-55	Relationship with news media
I-56	Relationship with subcontractors and suppliers
I-57	Relationship with the public

Table 1 Preliminary List of Indicators for Measuring Contractors' Competitiveness (continued)

Section V : Indicators Measuring Management Skills	
I-58	Availability and effectiveness of quality management system
I-59	Performance during the warranty period
I-60	Number of quality awards and punishments
I-61	Number of major accidents over past 3 years
I-62	Effectiveness of time management
I-63	Previous records about construction delays
I-64	Proportion of liquidated damage to project total value
I-65	Effectiveness of cost control methods
I-66	Establishment of contract administration system
I-67	Availability and competence of contracts manager
I-68	Effectiveness in settling contract dispute through negotiation
I-69	Ratio of successfully committed contracts
I-70	Number of contract disputes
I-71	Ratio of dispute settlement cost to contract sum
I-72	Effectiveness of co-ordination with subcontractors
I-73	Effectiveness of site management
I-74	Effectiveness of site safety management
I-75	Effectiveness of financial management
I-76	Knowledge about the local construction law
I-77	Effectiveness of accident settlement process
I-78	Effectiveness of environmental protection measures
I-79	Availability and effectiveness of risk management system
Section VI : Indicators Measuring Human Resources Strength	
I-80	Ratio of technical and professional staff in the organization
I-81	Staff salary scale relative to that of other organizations within the industry
I-82	Career prospect within organization
I-83	Availability of resources and programs for training
I-84	Appropriateness of organizational structure
I-85	Appropriateness of personnel structure
I-86	Mechanism for staff recruitment
I-87	Mechanism of distributing benefits and reward
I-88	Existence of strategies for human resources development

RELATIVE IMPORTANCE OF THE COMPETITIVENESS INDICATORS

Relative importance value (RIV)

The level of importance among individual competitiveness indicators listed in Table 1 can only be measured relatively, thus an index value, namely, relative importance value (RIV) is adopted. Relative index technique has been used extensively in research particularly for analyzing the data collected from structured questionnaire survey on individuals' judgments. For example, Olomolaiye et al. (1987) established relative index rankings from investigating the productivity performance by joiners, bricklayers and steel-fixers. Bubshait & Al-Musaid (1992) established relative importance indexes for illustrating the degree of involvement by construction owners/clients during construction process. Shash (1993) identified the important factors influencing contractors' tendering decisions by building up a relative index ranking. By using relative index method, Kometa et al. (1994) ranked construction clients' fundamental needs and examined the client-related attributes affecting construction consultants' performance.

The measure RIV for each individual competitiveness indicator is obtained from calculating the weighed average using the surveyed data through the following formula:

$$RIV = 100 \times \frac{\sum aX}{5N} \qquad (1)$$

Where

X: the frequency of the responses for a specific grade;

a: the weighting value (ranging from 1 to 5, where 1 is negligible and 5 is extremely important) corresponding to a specific grade;

N: total number of responses.

Data survey

For the calculation of RIV in the formula (1), the data for the variable X are needed. A questionnaire survey was conducted to collect the data for generating the values of X. The survey involved the participation of the registered contractors in the Hong Kong construction industry during the period from November 2004 to February 2005. All 338 contractors included in the Hong Kong Construction Association List were approached by providing the questionnaire by post, which was addressed to the General Manager of individual firms. Thus 338 questionnaires were distributed. The questionnaire was designed to collect the judgmental opinion from practitioners about the value of the relative significance of each competitiveness indicator. Respondents were invited to provide opinion by indicating a particular grade against each indicator. Table 2 shows a sample part of the questionnaire. There were 81 valid replies, giving a return rate of 24% (81/338).

Calculating the RIV

An indicator with higher RIV value indicates that the indicator has a higher effect on contractors' competitiveness. The rankings between individual indicators were established according to their RIV values. By using the data collected from the survey, calculations were conducted according to formula (1). And a sample result of the calculations is presented in Table 3.

Table 2 A Sample Part of the Questionnaire Table for Survey

A Survey for Improving Contractors' Competitiveness in Hong Kong

INSTRUCTION

A preliminary list of indicators is included in this questionnaire for assessing contractors' competitiveness, with particular reference to the Hong Kong construction industry. We are going to identify those Key Competitiveness Indicators (KCIs) based on professional opinion. There may be other indicators missed on this list. Please identify them as you go through the list.

Please indicate the degree of importance of each indicator for measuring contractors' competitiveness by selecting one of the five alternatives:

5-Extremely important; 4-Important; 3-Average; 2-Less important; 1-Negligible

SECTION I: Indicators Measuring Corporate Image

I1 Recognized grading for company	□ 5 □ 4 □ 3 □ 2 □ 1
I2 Professional qualifications of project manager	□ 5 □ 4 □ 3 □ 2 □ 1
I3 Business coverage & market share (by region)	□ 5 □ 4 □ 3 □ 2 □ 1
I4 Business coverage & market share (by industrial sectors)	□ 5 □ 4 □ 3 □ 2 □ 1
I5 Business specialism (design, or construction, etc.)	□ 5 □ 4 □ 3 □ 2 □ 1
.....	.....

Table 3 RIV of Indicators Measuring Corporate Image

Indicators	**Distribution between different grades**			***RIV***
	≥4	**3**	**≤2**	
Organization's credibility	88.75	11.25	0.00	83.50
Recognized grading for company	85.00	13.75	1.25	81.25
Project safety performance records	70.00	28.75	1.25	77.25
Bank credibility rating	70.00	27.50	2.50	76.75
Business specialism (design, or construction, etc.)	65.00	32.50	2.50	76.00
Professional qualifications of project manager	67.50	32.50	0.00	75.00
Project quality awards	63.75	30.00	6.25	74.25
Project environment & hygiene performance records	60.00	32.50	7.50	72.50
Corporate identity	57.50	40.00	2.50	72.00
Business coverage & market share (by industrial sectors)	47.50	45.00	7.50	70.50
Business coverage & market share (by region)	50.00	42.50	7.50	70.25
Compatible with the local culture	40.00	52.50	7.50	67.25
Social conscience and responsibility	41.25	46.25	12.50	66.50
AVERAGE				**74.08**

IDENTIFICATION OF KEY COMPETITIVENESS INDICATORS

According to the index values RIV in Table 3, the indicators in Table 1 were ranked. The key competitiveness indicators (KCIs) are selected as those whose RIV values are above the section average value and they are graded score at grade 4 or 5 by more than 50% correspondents. As a result, a list of key competitiveness indicators is selected, as shown in Table 4.

Table 4 Preliminary Selected Key Competitiveness Indicators

Section I : Indicators Measuring Corporate Image
I-6 Organization's credibility
I-1 Recognized grading for company
I-9 Project safety performance records
I-7 Bank credibility rating
I-5 Business specialism
I-2 Professional qualifications of project manager
I-8 Project quality awards
Section II : Indicators Measuring Technical Ability
I-17 Utilization efficiency of equipment and plant
I-26 Number of technical staff
I-14 Capacity of construction equipment and plant
I-30 Conversant with the local practice
I-25 Number of professional staff
I-16 Proportion of advanced construction equipment and plant
I-28 Standing of technology advancement within the industry
Section III : Indicators Measuring Financing Ability
I-42 Payment to subcontractors / suppliers on time
I-31 Credibility grade certified by relevant financial bodies
I-37 Organizational debt status
I-36 Organizational profit status
I-41 Capability of loan repayment
Section IV : Indicators Measuring Marketing Ability
I-53 On the tender list for governmental works
I-52 Relationship with private sector developers
I-56 Relationship with subcontractors and suppliers
I-54 On the tender list for private sector developers
I-46 Ability to forecast the changes of market conditions
I-51 Relationship with governmental departments
Section V : Indicators Measuring Management Skills
I-73 Effectiveness of site management
I-72 Effectiveness of co-ordination with subcontractors
I-65 Effectiveness of cost control methods
I-62 Effectiveness of time management
I-74 Effectiveness of site safety management
I-75 Effectiveness of financial management
I-67 Availability and competence of contracts manager
I-76 Knowledge about the local construction law
I-58 Availability and effectiveness of quality management system
I-79 Availability and effectiveness of risk management system
I-61 Number of major accidents over past 3 years
I-69 Ratio of successfully committed contracts
Section VI : Indicators Measuring Human Resources Strength
I-84 Appropriateness of organizational structure
I-82 Career prospect within organization
I-80 Ratio of technical and professional staff in the organization
I-83 Availability of resources and programs for training
I-85 Appropriateness of personnel structure

VALIDATION OF THE KCIs

In order to confirm the validation of the calculated KCIs, a further workshop was conducted. The workshop on "Understanding competitiveness for contractors in Hong Kong construction industry" was held on 25 February 2006 in the Hong Kong Polytechnic University. The participants were invited from the response list used for the questionnaire survey. 46 invitation letters were sent, 15 replied and 8 delegates actually attended the workshop. The 8 delegates were divided into three groups, with each group has one convener for facilitating the discussion in group. The workshop started with the introduction by the research team to explain research background, objectives and tasks. Then group discussions were held and facilitated by three conveners. Finally, the feedbacks were collected from each group. Constructive discussions were conducted during the workshop, leading to the generation of suggestions, as summarized in Table 5, for the modification of the selected KCIs.

Table 5 Group Suggestion Summary in Workshop

Group	Suggestions
Group 1	➢ The key indicators identified are suitable to the local construction industry. ➢ Competitiveness should cover maintenance field. ➢ Good relationship with architects/consultants is also important in marketing.
Group 2	➢ "Organization's credibility" (I-6) is subjective and not easy to evaluate. ➢ "Compatible with local culture" (I-12) should be a key factor, especially for new entrants. ➢ Indicators I-14, I-15 and I-17 can be grouped together. ➢ Indicators I-36 and I-37 can be grouped together. ➢ Indicators I-47 and I-48 should be a key indicator, particularly for Housing Authority Works. ➢ The indicator "Effectiveness of site management" (I-73) is too broad. ➢ Indicators I-62, I-65 and I-67 can be grouped together. ➢ "Mechanism of distributing benefits and reward" (I-87) should be a key indicator.
Group 3	➢ The identified KCIs are proper but there are still other indicators very important, such as retention of core staff, training, group-working, and problem solving ability.

The suggestions from the workshop provide useful reference for modifying the selected KCIs in Table 4. Based on the suggestions, the modified KCIs are produced accordingly, as shown in Table 6.

FINDINGS AND DISCUSSION

The above analysis leads to the identification of KCIs for measuring contractors' competitiveness in Hong Kong construction industry under six

Table 6 Key Competitiveness Indicators (KCIs) Based on Workshop

Section I : Indicators Measuring Corporate Image
KCI-1 Organization's credibility
KCI-2 Recognized grade of the company
KCI-3 Project quality / safety / environment performance
KCI-4 Banking credibility rating
KCI-5 Business specialism
KCI-6 Professional qualifications of project manager
Section II : Indicators Measuring Technical Ability
KCI-7 Capacity of construction equipment and plant
KCI-8 Capability of technical and professional staff
KCI-9 Conversant with the local practice
KCI-10 Proportion of advanced construction equipment and plant
KCI-11 Standing of technology advancement within the industry
Section III : Indicators Measuring Financing Ability
KCI-12 Payment to subcontractors / suppliers on time
KCI-13 Credibility grade certified by relevant financial bodies
KCI-14 Organization's financial status
KCI-15 Capability of loan repayment
Section IV : Indicators Measuring Marketing Ability
KCI-16 On the tender list for governmental works
KCI-17 Relationship with public / private sector
KCI-18 Relationship with architects / consultants
KCI-19 Relationship with subcontractors and suppliers
KCI-20 Ability to forecast the changes of market conditions
Section V : Indicators Measuring Management Skills
KCI-21 Effectiveness of site progress management
KCI-22 Effectiveness of co-ordination with subcontractors
KCI-23 Effectiveness of contract administration system
KCI-24 Effectiveness of site safety management
KCI-25 Effectiveness of financial management
KCI-26 Knowledge about the local construction law
KCI-27 Availability and effectiveness of quality management system
KCI-28 Availability and effectiveness of risk management system
KCI-29 Number of major accidents over past 3 years
KCI-30 Ratio of successfully committed contracts
Section VI : Indicators Measuring Human Resources Strength
KCI-31 Appropriateness of organizational and personnel structure
KCI-32 Career prospect within organization
KCI-33 Ratio of technical and professional staff in the organization
KCI-34 Availability and effectiveness of resources and programs for training
KCI-35 Retention of core staff
KCI-36 Effectiveness of group-working and problem solving

categories. They provide a valuable reference for professionals in Hong Kong construction industry to understand the practice of assessing contractors' competitiveness in the local construction market.

Corporate Image

The organization's credibility was considered a key indicator for corporate image by most respondents in the survey. Organizations' credibility is an invisible resource which helps to gain the trust from clients, public, or partners. High credibility can increase contractors' opportunities to win contracts. Contractors' good quality, safety and environment performance contribute directly to their corporate image. This has also been addressed by Hong Kong construction industry (CIRC, 2001) that more concerns should be given to improve contractors' quality, safety and environment performance.

Technical Ability

In Hong Kong, it is well noted that a wide gap exists in technical ability between local and foreign contractors. Walker (1995) noted that only a few local contractors could compete with the technologically and financially superior foreign contractors. Those localized foreign contractors have made success in Hong Kong construction industry, especially in civil engineering sector. Their success illustrates the important role of technology in gaining and sustaining the competitive advantages of international contractors. However, technology seems not being given priority in Hong Kong business. The survey in this study shows that the indicator 'Level of investment on Research and Development' is not considered as a key indicator in the local construction industry, evidencing the lower technology sense among the local contractors. This finding is also echoed by another study (Raftery et al., 1998).

Financing Ability

Subcontractors and suppliers play essential role in Hong Kong construction industry. In government statistics (Rowlinson, 1995), the value of subcontracted work constitutes over half of the total value of work done by all contractors (including both main and subcontractors). Without abundant natural resources, Hong Kong construction industry has to depend on imported materials, such as cement, steel, and wood. Therefore, as a general contractor, the ability of the payment to subcontractors and suppliers is essential, which was considered as the key competitiveness indicator in the survey. If the payment is deferred, the construction schedule will be affected, and contractor's credibility lost, and its competitiveness reduced in consequence.

Marketing Ability

Good relationship with clients, architects, consultants, subcontractors, and suppliers enables contractors to have more information and opportunity to obtain construction contracts. The government is one of the single largest clients in Hong Kong construction industry and is responsible for all public buildings, including hospitals, schools, etc; and all the major infrastructure projects including roads, tunnels, sewers, bridges, etc. Therefore, the inclusion of a contractor on the tender list for government works is considered an important indicator of good competence. Nevertheless, the data from Census and Statistics Department (C&SD, 2006) shows that the value of private sector works surpasses the public sector in recent years. Thus, establishing a good partnership with private clients is also considered an important competitiveness indicator.

Management Skills

Management skills reflect a contractor's ability to provide clients high quality products or service. The site progress management, co-ordination with subcontractors, contract

administration system, quality management, safety management and risk management are all considered as key indicators for measuring contractors' management skills, as shown in Table 6. Good management skills help contractors to maintain and improve their operation effectiveness and form the competitive advantages in bidding. This can be evidenced by the fact that foreign contractors who have better management experience are more successful in Hong Kong construction industry, especially in civil engineering sector, which requires contractors with better management skills (Raftery et al., 1998).

Human Resources Strength

Construction industry is a project-based industry. An appropriate organized structure within a contractor enables the company to make optimum use of resources and improve the quality and frequency of communication. An effective training system therefore plays an important role in improving contractors' human resource strength, as suggested in the workshop. The discussion in the workshop suggests that a well established training system will certainly have the advantage in attracting good human resources. It contributes largely to the improvement of a contractor's competitiveness as retention of core staff is one of the contractor's competitive advantages.

CONCLUSION

Construction market in developed countries or regions such as Hong Kong favors those contractors who have real competitiveness. This presents the importance for the contractors to gain a proper understanding on the practice of how their competitiveness is assessed in a specific construction market. This study found that there are a list of indicators adopted for measuring contractor competitiveness in the current Hong Kong construction market, and these key indicators have dominant influence on contractor competitiveness. The research results can help contractors to understand their strengths and weaknesses, thus prepare themselves effectively when they consider competing for construction works in Hong Kong, and improve the effectiveness of formulating competition strategies. Project clients can also find the research results valuable when they consider choosing proper indicators in a particular project environment to assess contractors' competitiveness for contractor selection. Whilst the data used in the analysis are collected from Hong Kong construction industry, the findings provide useful references for further studies in comparing the key competitiveness indicators used in other construction industries.

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