

# FACTOR ANALYSIS ON CONTRACTOR COMPETITION STRATEGY: A HONG KONG STUDY

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## Abstract

The development of construction industry has led to the increase in the number of criteria imposed by project clients for selecting contractors. For example, clients often request tenderers to satisfy various conditions such as tight programme, financial strength, managerial ability, relevant work experiences, technical strength, high workmanship standard, safety requirement, quality specification, and yet others. This trend has attracted research interests of devising various methods for helping project clients to assess contractors' bids. For example, in recent development, the Works Bureau of the Hong Kong Government has introduced two mechanisms in tender evaluation for various public work contracts, namely, the Marking Scheme effective from June 2002 and the Formula Approach effective from November 2002 [1], [2]. These approaches evaluate a contractor's tender by considering collectively its tender price and performance attributes, the latter including contractor experience, past performance, technical resources and technical content of his proposal. The tender with the highest combined price and performance score (CPPS) will be normally recommended for acceptance. It appears, however, that there is little existing research in helping contractors to identify a competition strategy that enables the contractor to offer his most competitive bid collectively taking into account his resource capacities and project client's multiple performance criteria. This paper examines the factors affecting contractor's competition strategy to compete for works in Hong Kong. The understanding about the factors will contribute to identifying effective competition strategy. The data used for the analysis were collected from Hong Kong construction industry. The research findings may provide valuable references for investigating effective competition strategies in other construction industries outside the region.

**Keywords:** Factor analysis, contractor, competition strategy, Hong Kong

## 1. Introduction

Previous research efforts in the fields have been devoted to finding solutions for helping clients how to select a contractor when project multiple objectives are considered. Traditionally, evaluation on contractors has been emphasized on tender price with less attention given to evaluating a contractor's performance attributes [3], [4], [5]. Nevertheless, the recognition that a high quality service cannot be obtained if only the lowest tender is accepted has led to a growing urge for a shift from 'lowest-price wins' to 'multi-criteria selection' practice in the contractor selection process. Hatush and Skitmore [6] suggested that evaluation of contractor competence should consider a wide range of factors such as financial soundness, technical ability, management capability, reputation and safety performance. The study by Lam et al. [7] 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.

Shen et al [8] [9] investigated the contractor competitiveness indicators adopted in China construction market, which are classified under the categories of social influence, technical ability, financing ability & accounting status, marketing ability, management skills, and organisation structure and operation.

The public clients in Hong Kong construction industry have introduced the Marking Scheme [1] and the Formula Approach [2] for tender evaluation of different types of public works contracts. Using these methods, a contractor's total competitiveness is assessed on a wider spectrum by considering collectively its tender price and performance attributes, and a combined price and performance score (CPPS) is used to assess the contractor's bid. Thus achieving a higher CPPS becomes an important business strategy for a contractor. Traditionally, the vast majority of public construction contracts are procured under the lowest bid system in Hong Kong, and tender price appears to be the main criterion used by clients in awarding contracts. This procurement practice was criticized for the continuing existence of non-compliant construction performance. The report by the Construction Industry Review Committee [10] suggests that the local tendency to award a contract at the lowest price has resulted in low profit margins, thus contractors have little incentive to do more than the minimum requirement. The report identifies the typical shortcomings in the local industry performance, including substandard work, cost overruns, project delays, poor site safety record, unsatisfactory environmental performance, poor workmanship, and so on. CIRC suggested that public sector clients should play a critical role in driving the construction industry to improve its operations through quality-oriented procurement strategies. In line with this promotion, the Works Bureau of the Hong Kong Government has introduced two methods: the Marking Scheme and the Formula Approach in tender evaluation for public works contracts [1] [2].

The Works Bureau Technical Circular No.22/2002 [1] introduces the Marking Scheme in tender evaluation for public works contracts where the quality of a project is a major consideration. In applying the scheme, the combined price and performance score (CPPS) for each tender is the weighted price score added to the weighted technical score, and normally, the tender with the highest CPPS will be accepted. The proportions for tender price and technical performance are 60/40. The weights distribution among various technical attributes has been designed by the Bureau. These technical attributes include tenderer's experience, past performance, technical resources, and quality of technical proposal. A tenderer's score on each technical attribute will be given with reference to the marking standard set by the Bureau.

In a further development, the Works Bureau Technical Circular No.23/2002 [2] introduces the Formula Approach in tender evaluation, by which a CPPS is still calculated but only one technical attribute is taken into account, namely, the tenderer's past performance. The Circular suggests that the use of the Marking Scheme has significant staff resource implications which may not be warranted for contracts where quality of service is not so demanding. And the Formula Approach is therefore designated not to take into account other technical attributes. In applying the Approach, the tenderer past performance is assessed taking into account the factors of workmanship, progress, site safety, environmental pollution control, organization, general obligations, industry awareness, resources, design, attendance to emergency, and attitude to claims. The weights distribution among these factors has been designed by the Bureau. And the score on each factor will be given with reference to the guidelines designed by the Bureau.

Both Marking Scheme and Formula Approach are used to evaluate tenders by considering tender price and multiple performance attributes. They are to assist public clients to select contractors who are competent and cost effective in achieving multiple project objectives, including cost control, construction time control, quality conformance, safety standard and environmental performance. As

the result, these developments have led to the demand from public clients for 'total competence' by a contractor. The lowest bid may not necessarily be the winner. Thus, contractors are very keen to formulate a competition strategy allowing for a better total competitiveness.

However, little work has been undertaken for helping contractors to formulate more competitive strategies when multiple performance attributes are applied in the contractor selection process. Shen et al [11] has developed an optimal bid model for assisting contractors in determining better bidding strategy when considering the tender price and construction time collectively. This development is based on the understanding that clients are increasingly calling for bids requiring submission of both the tender price and contract time. The model however does not discuss the factors affecting the applicability of the model. There are many factors affecting contractor competition strategy. The understanding on these factors is essential for identifying effective bid strategy. It is the focus of this paper to examine the factors affecting contractor's competition strategy to compete for works with reference to Hong Kong construction industry.

## **2. Identification of factors affecting competition strategies**

Ahmad and Minkarah [12] and Green [13] suggest that there are many factors, other than pure economic, to be considered in bidding strategy decisions. For some bidders at least, the combination of circumstances may be so different from one bid to another that flexibility and subjective factors in the end will prevail. Carr and Sandal [14] classified the factors affecting the bidding decision into three main categories, namely job characteristics, economic environment and competition condition. Flanagan and Norman [15] identified five major factors affecting contractor's bidding behavior: size and value of the project, and construction and managerial complexity required to complete it; regional market conditions; current and projected workload of the tenderer; type of client; type of project. Similarly, Drew and Skitmore [16] grouped factors influencing bidding behaviour into three aspects: the behaviour of contractors as a group (e.g. market conditions, number and identity of competitors); individual contractor behaviour (e.g. contractor size, work and tenders in hand, availability of staff); and behaviour toward the characteristics of the contract (e.g. type and size of construction work, client, location).

Furthermore, Drew et al. [17] examined the effect of three factors, namely size and value of project, type of client and type of project, on a contractor's bidding strategy using regression analysis. These three factors have all been identified as important competition factors in separate surveys, undertaken by Eastham [18], Shash [19] and Teo et al. [20]. In another survey, Odusote and Fellows [21] found that 75% of respondents identified client related factors and type of work as being the most important.

The examination on the existing studies of factors affecting contractor bidding behaviour leads to the formulation of an alternative list of factors affecting contractors' competition strategy under seven sections (variables), presented as follows (Table 1):

- A. Employer Selection Criteria
- B. Tender's Cost Planning
- C. Project Conditions
- D. Contractual Mechanism
- E. Tenderer's External Relationship
- F. Tenderer's Internal Strength
- G. Competitors' Situation

Table 1: Factors affecting contractors' competition strategy

<p><b>Section A: Employer Selection Criteria</b></p> <p>A-1 Tender price            A-2 Workmanship standard            A-3 Quality specification            A-4 Safety requirements            A-5 Construction method            A-6 Construction period            A-7 Liquidated damage            A-8 Contractor's relevant experiences            A-9 Contractor's past performance            A-10 Contractor's organization            A-11 Contractor's financial strength            A-12 Contractor's general image            A-13 Statutory restriction</p> <p><b>Section B: Tenderer's Cost Planning</b></p> <p>B-1 Preliminary            B-2 Cost of tendering            B-3 Cost of financing            B-4 Temporary works            B-5 Portion of nominated subcontractors (NSC)            B-6 Portion of domestic subcontractors (DSC)            B-7 Labor costs            B-8 Materials costs            B-9 Equipment costs            B-10 Plant costs            B-11 Prior quotations from suppliers/subcontractors</p> <p><b>Section C: Project Conditions</b></p> <p>C-1 Nature of construction and installation            C-2 Tightness of master program            C-3 Coordination difficulties            C-4 Involvement of public utilities            C-5 Design obligation            C-6 The use of PRC / international standard            C-7 Nature of project user            C-8 Working and storage area            C-9 Transportation condition            C-10 Fabrication arrangement            C-11 Subsoil and weather condition            C-12 Potential labor disputes</p> <p><b>Section D: Contractual Mechanism</b></p> <p>D-1 Payment terms            D-2 Technical submission and approval            D-3 Progress meetings</p>	<p>D-4 Claim restrictions            D-5 Fluctuation clauses            D-6 Variation of design            D-7 Materials or equipment changes            D-8 Provision of bonds            D-9 Insurance requirement            D-10 Arbitration clause            D-11 Contract type (lump sum, measurement, or reimbursement)            D-12 Subletting restriction</p> <p><b>Section E: Tender's External Relationship</b></p> <p>E-1 Employer's personnel            E-2 Consultants            E-3 Resident supervision staff (client/consultant)            E-4 Suppliers            E-5 Nominated subcontractors (NSC)            E-6 Domestic subcontractors (DSC)            E-7 Banks            E-8 Insurance company            E-9 Plants providers            E-10 Adjacent owners</p> <p><b>Section F: Tenderer's Internal Strength</b></p> <p>F-1 Managerial ability            F-2 Financial conditions            F-3 Control of progress            F-4 Claim experiences            F-5 Relevant work experiences            F-6 Administration system            F-7 Human resources            F-8 Staff morale            F-9 Present job commitment            F-10 Litigation and or arbitration experiences</p> <p><b>Section G: Competitors' Situation</b></p> <p>G-1 Existing number of competitors            G-2 Present commitment of competitors            G-3 Tenderer's special purpose to tender            G-4 Projects available in the market            G-5 The possibility of joint-bid            G-6 Competitors' financial conditions            G-7 Competitors' past performance            G-8 Competitors' eagerness to bid            G-9 Subletting to competitors</p>
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The formulation of the above list was also contributed by conducting a number of interviews with professionals in Hong Kong construction industry. The interviews contributed to improving the suitability and clarity of the proposed factors. Valuable suggestions were contributed by the interviewed practitioners, which have been taken into consideration in the formulation of the list.

### 3. Examination on the level of importance between factors

#### 3.1 Data survey

A questionnaire survey has been conducted for understanding the level of importance of these individual factors to the choice of contractors' competition strategies. The survey involved the participation of the contractors in the Hong Kong construction industry during the period from May 2006 to July 2006. All contractors included in the Hong Kong Construction Association List were targeted, with 338 contractors in total on the list. The questionnaire was designed to collect the judgmental opinion from practitioners about the importance of individual factors to contractors' competition strategy by indicating a particular grade.

In the survey, the respondents were invited to indicate the value of the relative significance of each factor on choosing competition strategy when competing for public construction works. Respondents were advised to allocate the grade by selecting a figure between 1 and 5, where scale '5' denotes extremely important, '4' important, '3' average, '2' less important, and '1' negligible.

### 3.2 Relative Significance Value (RSV) and Calculation

The level of importance of the individual factors listed in previous section can be assessed relatively, and an index value, namely, relative significance value (RSV) is therefore adopted. The method of relative index has been used extensively in research particularly, for analyzing the data collected from structured questionnaire survey on correspondents' judgments. For example, Olomolaiye et al [22] established relative index rankings for investigating the productivity performance by joiners, bricklayers and steel-fixers. Bubshait and Al-Musaïd [23] established relative importance indexes for illustrating the degree of involvement by construction owners/clients during construction process. Shash [19] identified the key factors influencing contractors' tendering decisions by building up a relative index ranking. By using relative index method, Kometa et al [24] ranked construction clients' fundamental needs and examined the client-related attributes affecting construction consultants' performance. Tan et al [25] presented the key competitiveness indicators by calculating individual indicators' relative index values.

The value of RSV for each individual factor is obtained from calculating the weighed average on surveyed data through the following formula:

$$RSV = 100 \times \frac{\sum aX}{5N} \quad (1)$$

Where

*X*: the frequency of the responses from the survey 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.

There were 40 effective replies in the survey, and Table 2 presents the sample summary of the survey results. By using the data in Table 2, calculations are conducted according to model (1), where *X* is the response frequency from all responses to a particular grade and for a particular indicator. The results of the calculations are also presented in Table 2.

Factors	Response Distribution					Mean	Std. Deviation	RSV
	5	4	3	2	1			
A-1	24	15	1	0	0	4.5750	.54948	89.27
A-2	5	22	12	1	0	3.7750	.69752	73.66

A-3	4	16	19	1	0	3.5750	.71208	69.76
A-4	6	16	16	2	0	3.6500	.80224	71.22
A-5	1	21	13	5	0	3.4500	.74936	67.32
A-6	4	28	8	0	0	3.9000	.54538	76.10
A-7	2	21	15	2	0	3.5750	.67511	69.76
A-8	6	21	13	0	0	3.8250	.67511	74.63
A-9	6	17	16	1	0	3.7000	.75786	72.20
A-10	3	12	19	5	0	3.3333	.80568	63.41
A-11	9	20	10	1	0	3.9250	.76418	76.59
A-12	0	11	25	3	1	3.1500	.66216	61.46
A-13	1	8	26	5	0	3.1250	.64798	60.98
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A	17	19	4	0	0	4.3250	.65584	84.39
B	19	15	6	0	0	4.3250	.72986	84.39
C	3	24	11	2	0	3.7000	.68687	72.20
D	2	26	11	1	0	3.7250	.59861	72.68
E	3	22	12	3	0	3.6250	.74032	70.73
F	7	21	8	4	0	3.7750	.86194	73.66
G	8	18	11	3	0	3.7750	.86194	73.66

### 3.3. Identification of key competition strategy factors

According to the index values *RSV* in the left column in Table 2, factors can be ranked. Factors receiving 75 or above *RSV* value are considered as key factors, which are listed as follows:

- Tender price (A-1);
- Tightness of master program (C-2)
- Financial conditions (F-2)
- Payment terms (D-1);
- Contract type (lump sum, measurement, or reimbursement) (D-11);
- Managerial ability (F-1);
- Existing number of competitors (G-1);
- Employer's personnel (E-1);
- Control of progress (F-3);
- Projects available in the market (G-4);
- Competitors' eagerness to bid (G-8);
- Cost of financing (B-3);
- Relevant work experiences (F-5);
- Contractor's financial strength (A-11);
- Construction period (A-6);
- Nature of construction and installation (C-1);
- Resident supervision staff (client/consultant) (E-3);
- Present commitment of competitors (G2);

The identification of the key competition strategy factors provides valuable data for helping contractors to analyze their effective competition strategies with considering their own strength and weakness.

## 4. Typical competition strategies and the associated key factors

Previous research works have investigated various competition strategies in construction market. For example, Friedman [26] considers the existence of several possible objectives that a bidder may wish to achieve, and from which different bidding strategies will be developed, including: (1) maximize total expected profit; (2) gain at least a certain percentage of investment; (3) minimize expected losses; (4) minimize profits of competitors; (5) keep production going. Fine [27] identified several strategies such as random bidding when work levels are low, selective bidding and severely competitive bidding with later claim. Stone [28] has also suggested that some firms accept lower standards of work than others and that there are differences in efficiency and therefore, cost.

By examining literatures and the above identified factors, the typical competition strategies particularly in Hong Kong construction market can be classified into: lower bid strategy, joint venture strategy, public relation strategy, risk control strategy, and claim strategy.

#### **4.1 Lower bid strategy**

By adopting the lower bid strategy, contractor will offer a much lower bidding price than other competitors, thus the chance of winning the contract will be increased. The adoption of this strategy is mainly determined by the following major factors:

- (1) A-1: Tendering price to compete
- (2) D-1: Payment term
- (3) B-3: Cost of financing
- (4) B-1: Preliminary cost
- (5) B-2: Cost of tendering
- (6) B-7: Labour costs
- (7) B-8: Materials costs
- (8) B-9: Equipment costs

Lower bid strategy is often adopted in Hong Kong. By this strategy, Construction Company can secure more projects, thus the company can maintain reasonable cash flow and retain the human and technical resources recruited previously during the expansion of the company in the construction booming period.

#### **4.2 Risk control competition strategy**

Construction business is generally appreciated as a high-risk business, and on the hand, construction firms are commonly risk-averse as most of construction firms have limited finance capacity. Contractors normally rely on the project payments from client to keep cash flow and maintain the operation of business. It is very important for contractors to control risks thus avoiding the occurrence of unacceptable risk consequences. The adoption of risk control strategy is mainly determined by the following major factors:

- (1) D-11: Contract type
- (2) A-6: Construction period
- (3) C-1: Nature of construction and installation
- (4) G-3: Special purpose to tender
- (5) B-11: Prior quotations from suppliers/ substrates
- (6) A-7: Liquidated damage
- (7) B-6: Portion of DSC

- (8) B-5: Portion of NSC
- (9) D-5: Fluctuation clause

#### **4.3. Joint venture competition strategy**

Forming joint venture can help contractors to reduce the competition and reduce risks as risks can be shared. This is particularly feasible for public sector works which are often of large size and more uncertainties. The adoption of joint venture competition strategy is mainly determined by the following major factors:

- (1) G-4: Project available in the market
- (2) G-1: Existing number of competitors
- (3) G-8: Contractor eagerness to bid
- (4) G-2: Present commitment of competitors
- (5) G-6: Competitor financial condition
- (6) G-7: Competitor past performance
- (7) D-2: Technical submission and approval
- (8) F-9: Present job commitment.

#### **4.4. Public relation competition strategy**

Construction organizations generally have a public relation department to promote the organizational image and assist in collecting marketing information. Public relation becomes an important organizational resource for both small and large firms. Small construction firms build up public relations usually through building up individual contacts and links, thus the costs for public relations can be reduced. On the other hand, large construction organizations make public relations often through setting up higher standards, producing high quality products and services, and cultivating corporate brand. The adoption of public relations strategy is mainly determined by the following major factors:

- (1) E-1: Relationship with employer's personnel
- (2) E-3: Relationship with supervision staff
- (3) E-2: Relationship with consultants
- (4) A-9: Contractor past performance
- (5) C-3: Coordination difficulties
- (6) F-8: Staff moral
- (7) E-5: Relationship with NSC
- (8) E-6: Relationship with DSC

#### **4.5. Claim strategy**

Claim has become a strategy in particular for those large construction firms to make extra incomes. Claim usually engages a long and legally expensive process thus it is rarely adopted by small firms who can not afford the associated costs. In Hong Kong practice, claims will not be allowed before the completion of project. Furthermore, it is not certain whether a particular claim will be successful and small firms normally just accept the conditions imposed by project clients. The adoption of claim strategy is mainly determined by the following major factors:

- (1) F-4: Claim experiences
- (2) D-6: Variation of design



- (3) D-4: Claim restriction
- (4) C-5: Design obligation
- (5) F-6: Administration system
- (6) D-7: Materials or equipment changes

## 5. Summary and Conclusion

The data analysis in the previous section shows that the cost associated factors, in category A and B, are dominant factors affecting the choice of contractor competition strategy. Thus lower bid strategy is most popular in the current Hong Kong construction market in particular for public sector works. This is considered the major contributors to the lower quality standards in the local construction practice. Nevertheless, individual contractors have different competitiveness which is demonstrated across many aspects such as financial strength, technical ability, and others. These differences suggest that individual contractors should take different competition strategies that suit best to their background and interests. Both contractors and clients should take the advantages of other types of competition strategies thus to improve business performance.

This paper has identified factors affecting the choice of competition strategy when competing for works with reference to Hong Kong construction industry. Typical competition strategies include lower bid strategy, joint venture strategy, public relation strategy, risk control strategy, and claim strategy. The identification on the attributes to the choice of these strategies provides guidance for contractors to choose proper competition strategy by considering properly the associated factors. 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 factors affecting contractors' competition strategy in Hong Kong and those factors in other construction industries.

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