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Decision Criteria for Selecting Main Contractors in Malaysia

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Abstract: During the tendering phase of a project, selecting the most appropriate main contractor to implement the project can be difficult. There are many main contractor selection criteria that can be found in the literature but in real practice, clients may have their different criteria. The purpose of this study is to identify and rank the actual criteria used by clients for the selection of main contractors from current practice in Malaysia. The ranking is based on the relative importance of the criteria as perceived by professionals operating in the Malaysian construction industry using their accumulated experience and judgment. The objective of this study was investigated through a postal questionnaire which covered a selected sample of 150 construction professionals operating in Malaysia. Data were analyzed using frequency and severity index analyses. The results of this study show that track performance, financial capacity and technical capacity were the most important criteria considered crucial by the respondents for the selection of main contractors from current practice in Malaysia. This study provides supportive practical solution for Malaysian clients to enhance and improve their contractor selection processes in order to have successful completion of construction projects that would meet their requirements and increase their satisfaction levels.

Key words: Client, construction, professional, project, survey

INTRODUCTION

Generally, successful completion of construction projects requires many important processes and one of them is the bidding process. During the bidding process, selecting the most appropriate contractors to execute the project seems to be quite difficult. Contractor selection plays a vital role in the overall success of any construction project. Clients generally need the best criteria in selecting contractors in order to get best results in term of cost, time, and quality for their projects. Historically, clients usually award the contract to the lowest bidder during tendering. Despite the guidelines that exist in the literature in selecting main contractors; in real practice, Malaysian construction clients individually have their preferred criteria different from those obtained in the literature. The main threat here is that clients do make costly mistakes in their decisions to award the contracts to unqualified contractors and this would eventually have damaging consequences on the project and clients' investment. It therefore became necessary to examine the different criteria adopted by clients in selecting contractors in Malaysia in order to find out the most important criteria that clients should focus on when awarding construction contracts to main contractors. To this regard, this paper is aimed at identifying and ranking the actual criteria used by clients in real practice for the selection of main contractors in Malaysia.

LITERATURE REVIEW

Various studies have been undertaken by experts regarding the issue of contractor selection for implementing construction projects. Holt *et al.* (1994) identified prequalification criteria to be included in the quantitative model for choosing main contractors. Ahmed and Kangari (1995) carried out a survey with 101 client companies to find out the factors that the clients consider as being the most significant when dealing with contractor organizations and hence develop a client-satisfaction model. Holt *et al.* (1995) revealed that the choice of contractor should be made on a value for money basis rather than automatically accepting the lowest bid because the main objective is to identify best tender not lowest bidder. Bubshait and Al-Gobali (1996) determined the criteria that are considered in prequalification practices for private and semi public projects in Saudi Arabia. Hatush and Skitmore (1997) focused on identifying universal criteria for prequalification and bid evaluation. Their results show that the most common criteria considered by clients are those pertaining to financial soundness, technical ability, management capability and health and safety performance of contractors. Holt (1997) explained the cluster analysis technique in a contractor valuation and selection setting. Hatush and Skitmore (1998) described a systematic multi criteria decision analysis method for contractor selection based on utility

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Table 1: Criteria for selection main contractor from literature review

	Previous study			
Main contractor selection criteria	Topcu (2004)	Palaneeswaram and Kumaraswamy (2001)	Skimore (1999)	Holt *et al*. (1995)
Financial stability	√	√	√	
Background of company	√	√	√	
Technical capacity		√	√	
Cost	√	√	√	√
Performance	√			
Standard of quality	√	√	√	√
Occupational health and safety	√	√	√	
Time performance	√	√	√	√
Management capability	√			
Failed contract	√			
Progress of work	√			
Human resource management			√	
Level of technology	√			
Relationship with client		√	√	
Relationship with sub-contractors	√			
Fraudulent activity	√			
Competitiveness	√			

theory, which allows different types of quantitative and qualitative contractor capabilities to be assessed. Chinyio *et al*. (1998) defined a checklist of clients' needs which can be used for determining clients' project requirements. Ng and Skitmore (1999) examined the difference between the decision criteria used by different client and consultant organizations in contractor selection. Respondents were asked to rate the importance of 35 predetermined selection criteria. The findings show that there are significant differences in the selection and use of decision criteria for prequalification. Alsugair (1999) developed a model for assessing bids of construction contractors in Saudi Arabia. The conceptual model includes identifying the criteria involved in bid evaluation, the impacts and weights of these criteria and the criteria's score. Ng *et al*. (1999) reported on an assessment of the nature of divergences of the perceived significance of individual prequalification criteria by different groups of pre qualifiers through an empirical survey conducted in United Kingdom. Wong *et al*. (2000) identified factors as project specific criteria which are used by the clients in the process of selecting contractors. A comparison of top 15 project specific criteria indicates a strong association between public and private sector clients and for building and civil engineering works. Palaneeswaran and Kumaraswamy (2001) proposed a new model for construction contractor prequalification while Topcu (2004) proposes a multi-criteria decision model for selecting contractors in the Turkish public sector. These studies are important because they emphasize the factors that different categories of client groups take into consideration when choosing contractors. Egemenn and Mohamed (2006) provided insights into private clients' needs, wants and expectations from contractor firms in the Northern Cyprus building construction market, by presenting survey findings of 91 clients regarding this issue. Huang (2011) analyzed the relevant theoretical methods for contractor evaluation and examined the actual criteria for the selection of contractors.

Despite all the guidelines that exist in the literature in selecting main contractors; in real practice, clients in Malaysia individually have their preferred criteria different from those obtained in the literature. The main threat here is that clients do make costly mistakes in their decisions to award the contracts to unqualified contractors and this would eventually have damaging consequences on the project and clients' investment.

METHODOLOGY

The study was conducted between July 2008 and June 2009 as a final year project research in fulfilment of the requirements needed for the award of B. Eng. Degree in Civil Engineering Department, Universiti Teknologi PETRONAS, Bandar Seri Iskandar, 31750 Tronoh, Perak, Malaysia.

A literature review on the selection of main contractor suggested a combined list of criteria used by clients when choosing a main contractor (Holt *et al*., 1995; Skitmore, 1999; Palaneeswaran and Kumaraswamy, 2001; Topcu, 2004). Based on this review (Table 1) and information from professionals in Malaysian construction industry, a list of 14 criteria influencing selection of main contractor was produced. In construction management researches, questionnaires are mostly used to collect factual and perceptive responses. Fellows and Liu (1997), Naoum (1998) and Enshassi *et al*. (2010) argued that the questionnaire is a widely used approach for descriptive and analytical surveys to find out the facts, opinions and views of respondents. A postal questionnaire was chosen for the survey in view of its relatively low cost and the fact that respondents are given sufficient time to complete the questionnaire to elicit well thought out responses. The development of the questionnaire is done in such a way

that each question would be clearly phrased to avoid ambiguity and checked for expression, objectivity and relevance to the problem being investigated (Leedy, 1989; Foddy, 1993; Idrus, 2001). It was paramount that the perception of the clients obtained from this survey would be as representative as possible. The lists of the respondents were obtained from lists provided by Suruhanjaya Syarikat Malaysia (SSM), Construction Industry Development Board (CIDB) and also from Malaysia Resources Corporation Berhad (MRCB). The sample respondents were located in all state in Peninsular Malaysia. The sample was selected using the systematic sampling procedure (Idrus, 2001). In this procedure, the Clients' list was arranged in alphabetical order and sampled at regular intervals after a random start. The sample interval is the ratio N/n where N and n represent the population and desired sample size respectively.

The size of samples is governed by factors such as (Idrus, 2001):

- The confidence level needed that the sampled data would be representative of the total population
- The margin of error that can be tolerated for any estimates of the population parameters from the sample i.e., the sampling error
- The time allocated for conducting the survey and the cost incurred

However, sample size is also determined by the significance of the survey results to the research as a whole (Idrus, 2001). In order to address the objective of this paper, a minimum sample size of 30 (Idrus, 2001) was taken as the minimum set for the survey. Nevertheless, to allow for non-response, the sample size was increased to 200. The questionnaires were distributed to professionals (who are involved in tender evaluation and selection of contractors) working for clients' organizations within the Malaysian construction industry. In administering the questionnaires, respondents were asked to rate the level of importance of a list of criteria used by clients in the selection of contractors in Malaysia. The rating was based on a 5-point Likert scale where 1 = Very Low, 2 = Low, 3 = Moderate, 4 = High and 5 = Very High. The respondents were also allowed to add other criteria not covered by the questionnaire.

Analyses and results: Of the original sample of questionnaires, 150 (75%) were returned fully completed and the number exceeded the minimum specified above. Compared with other similar surveys in the areas of construction management, e.g., 21% by Proverbs (1999), 30-40% by Aibinu and Jagboro (2002), 27% by Idrus, (2001), the response rate obtained (75%) is considered to be good. The data collected from the survey were ordinal because the distances between any two numbers (ratings) assigned in the Likert scale are not known. The use of parametric statistics (means, standard deviations, etc.) to analyze such data would not produce meaningful results and non-parametric procedures should therefore be adopted (Siegel, 1956; Siegel and Castellan, 1988; Johnson and Bhattacharyya, 1996). The non-parametric procedures adopted for this study were frequency and severity index analyses.

Relative index ranking technique is a non-parametric technique widely used by construction management researchers for analysing structured questionnaire response data involving ordinal measurement of attitudes (e.g., Olomolaiye *et al*., 1987; Holt, 1997; Idrus, 2001; Egemenn and Mohamed, 2006). One form of this technique is the severity index analysis (Elhag and Boussabaine, 1999; Al-Hammad, 2000; Ballal, 2000) which uses weighted percentage scores to compare the relative importance of the criteria under study. The frequency analysis was first carried out to determine the frequency of responses which were then used to calculate severity indices by means of the formula:

$$\text{Severity Index (I)} = [\sum a_i \,.\, x_i\,] \,/\, [\,5 \sum x_i\,] \;*\; 100\%$$

where,

x_i = variable expressing the frequency of the response for i
i = 1, 2, 3, 4, 5 as illustrated below
$x5$ = frequency of the 'very high extend' response and corresponding to $a5 = 5$
$x4$ = frequency of the 'high' response and corresponding to $a4 = 4$
x3 = frequency of the 'moderate' response and corresponding to $a3 = 3$
$x2$ = frequency of the 'low' response and corresponding to $a2 = 2$
$x1$ = frequency of the 'very low response and corresponding to $a1 = 1$

The Severity Index would enable the author to prioritize the criteria in the study. Criteria with highest severity index (%) will be ranked topmost while criteria with the least severity index (%) will be ranked at the bottom. The five-point scale was transformed to relative importance indices for each criterion, using the above method to obtain the ranks of the different criteria. These ranking enabled the researcher to cross-compare the relative importance of the criteria as perceived by the three categories of respondents. However, the mean and standard deviation of each individual criterion are not appropriate statistics to evaluate the overall rankings because they do not reflect any relationship between them. As such, all the numerical scores of the identified criteria were transformed to severity indices (in percentages) to determine the relative ranking of the criteria.

Table 2: Types of business for respondents' companies

Types of project	No. of respondents	Percentage
Residential projects	64	42.67
Commercial projects	46	30.67
Industrial projects	14	9.33
Infrastructure projects	26	17.33
Total	150	100

Table 3: Respondents' companies experience in construction

Company's experience in construction	No. of companies	%
Less than 5 years	2	4
5 to 10 years	6	11
11 to 20 years	54	4
More than 20 years	23	41
Total	56	100

RESULTS AND DISCUSSION

Company information: Table 2 shows the types of business respondents' companies are involved in. A total of 56 companies responded to the questionnaire and some of the companies are involved in more than one sector. From the Fig. 1, it is shown that respondents working for clients dealing mainly with residential projects have the highest proportion (42.67%) while the least (9.33%) is clients dealing mainly with industrial projects. The high proportion of respondents working for client companies dealing with residential projects could be attributed to the mass housing projects being commissioned all over the country in an effort by the government to provide housing for the people. The Malaysian government has identified housing as an essential need and a significant component of economic development. To this regard, the government developed a plan to ensure it meets the housing needs of its people. The housing development programmes are implemented by the public and private sector. The public sector focuses more on low cost housing programmes while the private sector focuses more on medium and high cost housing programmes. It is not surprising to have a high proportion of clients dealing with residential projects because the government has formulated a policy which aims at strengthening the participation of private sector in housing production and delivery especially in housing schemes development.

Table 3 shows percentage of company's experience in construction. Over 80% of the companies have more than 10 years experience in construction projects. This could add validity to their responses because the longer the period the companies have been involved in construction projects the more experienced they become and this reflect on the expertise of their staff. 4% of the companies have less than 5 years construction experience and this may not be considered good enough because companies that do not have good experience might not be very familiar with the criteria that clients in Malaysia usually consider in selecting contractor for construction proejcts.

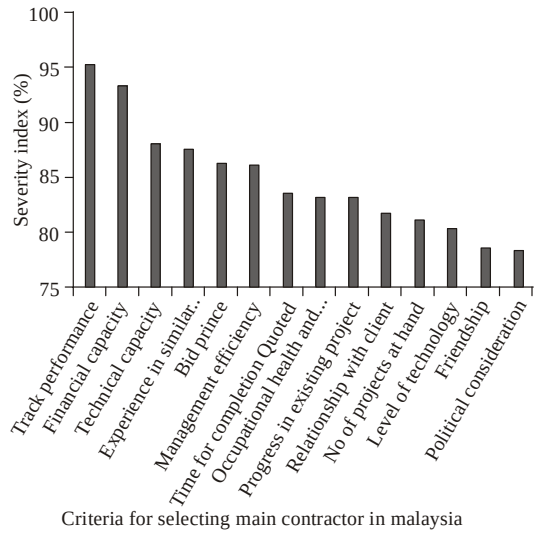

Fig. 1: Severity index (%) of criteria for selection of main contractor in Malaysia

Table 4: Present designation in the company

Present designation in the company	No. of respondent	%
Project director	24	16.00
General manager	38	25.33
Quantity surveyor	6	4.00
Engineer	10	6.67
Project manager	52	34.67
Other	20	13.33
Total	150	100

Table 5: Respondents' experience in construction (years)

Respondent's experience in construction (years)	No. of respondent	%
Less than 5	6	4.00
5 to 10	36	24.00
11 to 20	50	33.33
More than 20	58	38.67
Total		100

Respondent's information: Table 4 shows the proportion of the present designation of respondent in their respective companies. It shows that Project Managers have the highest proportion (34.67%) while quantity surveyors have the lowest proportion. Having project managers as respondents from the organizations would help to validate the findings of this paper because they are usually given the task to evaluate and select main contractors to execute the projects.

Table 5 shows the proportion of respondent's experience in construction. Over 70% of the respondents have the requisite construction experience of over ten (10) years. Having respondents with such an impressive working experience in construction indicates that the respondents are well conversant with selecting suitable contractors to implement projects. This really adds validity to the findings of this study.

Table 6: Respondent's location according to states in Malaysia

State	No of respondent	Percentage
Johor	18	12.00
Kedah	9	6.00
Kelantan	6	4.00
Melaka	6	4.00
Negeri Sembilan	6	4.00
Pahang	8	5.33
Perak	10	6.67
Perlis	8	5.33
Penang	8	5.33
Sabah	8	5.33
Sarawak	10	6.67
Selangor	44	29.33
Terengganu	9	6.00
Total	150	100

Table 6 shows percentage of respondent's location according to states in Malaysia. There are many factors contributing to these results. First, it is obvious that Selangor harbours the federal territory of Kuala Lumpur which serves as the seat of Malaysian government. This state is considered the most rapidly developing state in Malaysia due to the large scale developmental projects going on and this might be connected to the country's developmental programme known as the vision 2020. In this survey, Selangor has the highest percentage (29.33%) of the respondents simply because of the high number of construction projects being carried out and it is natural that clients and contractors would always focus on such area due to good market prospects. Surprisingly however, states like Melaka and Negeri Sembilan have low proportion of respondents (4%) despite their proximity to Kuala Lumpur which is beehive of construction activities in the country.

Table 7 shows the severity index and ranking of criteria for selecting main of criteria for selecting main contractor in Malaysia. From the table, it could be seen that Track performance is the most important criteria ranking 1st with the highest severity index (94.93%). The ranking of this criterion is not surprising at all because clients have to examine the main contractor's reputation in order to ascertain which contractor has true ability to handle the project. Examination of a contractor's past experience reveals to the client what a contractor has done, whether or not these projects have been executed successfully would only be identified from an investigation of contractor's performance. Since the core business of the construction industry is undertaking projects, the project objectives of quality; cost and time became significant because they are the main indicators of client satisfaction. As such, the goal of most construction clients is to have best value for their money. Thus, Birrel (1988) in a paper titled bid appraisal incorporating past performances by contractors suggests that contractors who have a track record of successful past performance and demonstrate a current superior ability to deliver a project should be selected. Contractor's track performance record is relevant information regarding a contractor's actions under previously awarded contracts. These records include conformance to contract requirements and to standards of good workmanship; cost forecasting and control; adherence to contract schedules including administrative aspects of performance; history of reasonable and cooperative behaviour and commitment to client satisfaction and contractor's business-like concern for the interest of the client (Birrel, 1988). Selecting a contractor based on track performance records help to ensure that best value for money is achieved because the project stands a chance of being completed on time and to the desired quality standards as spelt out in the specifications. More so, the selection of contractors based on this criterion provide clients with an objective and consistent means of implementing pre-qualification process as performance information of other contractors would be available for comparison and selection. Not that alone, professionals working for the client would be able to know specific areas of the contractor's performance to focus on during project supervision in order to ensure successful implementation of the project. However, considering the requirements of clients and end-users, environmental awareness, scarce resources, globalization of the construction industry which ushered in high

Table 7: Severity index and ranking of criteria for selecting main contractor for all 150 respondents

Criteria for selecting main contractor	$a_1 \times x_1$	$a_2 \times x_2$	$a_3 \times x_3$	$a_4 \times x_4$	$a_5 \times x_5$	$\Sigma (a_i \times x_i)$	$5\sum x_i$	Severity index (%)	Rank
Track Performance	0	0	24	88	600	712	750	94.93	1
Financial capacity	0	8	30	80	580	698	750	93.07	2
Technical capacity	0	22	57	80	500	659	750	87.87	3
Bid price	0	50	15	40	550	655	750	87.33	4
Experience in similar projects	0	14	120	12	500	646	750	86.13	5
Management efficiency	0	32	60	72	480	644	750	85.87	6
Time of completion quoted	9	12	63	116	425	625	750	83.33	7
Occupational health & safety	5	32	69	56	460	622	750	82.93	8
Progress of existing project	0	8	57	316	240	621	750	82.80	9
Relationship with client	0	28	129	44	410	611	750	81.47	10
No of projects at hand	0	54	30	168	355	607	750	80.93	11
Level of technology	0	52	42	172	335	601	750	80.13	12
Friendship	8	58	51	40	430	587	750	78.27	13
Political considerations	0	46	84	156	300	586	750	78.13	14

competition for construction business marketplace, it became glaring for contractors to continuously improve their performance in order to have good track performance record which is critical to contractors' business success. The improvement in performance involves evaluation of contractors' performance which aligns the contractors' resources, activities and processes to the main goals of their organizations. The performance improvement deals with long term organizational goals which help to set standards for comparison with best practices in other construction companies and provide the basis for comparison during internal change efforts and shows results during improvement efforts.

The financial capacity of a contractor is the next most important criterion with severity index of 93.07%. It is also significant as it enables a client to obtain information regarding the overall financial position of the main contractor. If the old trend was to be considered, surely the bid price would be chosen as the first criteria for selection of main contractor in Malaysia. However, clients nowadays still aim for a higher profit margin and at the same time expect higher satisfaction from the products and services offered by the contractor. Engaging contractors to implement a construction project can expose clients to significant financial risk. The failure of a contractor to complete successfully a project can cause great inconvenience, unnecessary delays and significant costs. Best practice risk management suggests that adequate due diligence checks are carried out to measure the financial capacity of the recommended contractors to fulfill their contractual obligations (Topcu, 2004). Financial capacity refers to a contractor's strength in the market to carry out projects. Sufficient financial resources ensure that contractor can get into risky situations that have high returns prospect. Warszawski (1996) pointed out that as a contractor's financial strength increases, his credibility and reputation also increases among clients and suppliers. Kaplan and Norton (1996) and Liebowitz and Suen (2000) argued that though increase in revenues and profitability, market value, cost reduction, productivity improvement, enhancement of asset utilization/profit per total assets, uncompleted work in hand, economic value added, reliability of performance and reduction in risk can be used as indicators of financial strength of a contractor, however, the financial strength of a contractor is generally measured by examining the ratio of his liabilities to equities Most construction projects are funded by the client who pays the contractor periodically, who in turn pays the subcontractors, the suppliers and other parties of the project for services rendered. A portion of the periodic payments is normally held by the client as retainage. The success of this routine depends on the financial strength of the client and contractor (Gunhan and Arditi, 2005). The financial stability of a contractor indicates whether he will stand or fall and therefore figures high on the lists of many authors (Russell *et al*., 1992; Russell and Skibniewski, 1988).

Technical Capacity is the third most important criteria with a severity index of 87.87%. This criterion is perceived to be highly significant by the respondents because clients use it to measure contractor's technical ability such as experience, plant, equipment and personnel based on past performance. In other words, clients assess the technical competency of contractor by focusing on his physical assets (such as machinery and equipment) and the level of technical expertise available that is necessary to implement particular projects. Warszawski (1996) pointed out that the technical competency of a contractor can be established by examining his preferred construction techniques, the skills and expertise of his of his technical staff, the productivity and speed of his construction processes and the quality of the contractor's services and final output. The three least important criteria however were level of technology (80.13%), friendship (78.27) and political considerations (78.13). Level of technology was perceived by the respondents to be least important because the main contractors in Malaysia are having relatively same level of technology and the clients consider this as less significant criterion. The friendship and political considerations criteria were placed at the lowest ranking because clients believe that when business mixes-up with politics and friendship, profit margin will be relatively low and in fact, a lot of other problems might occur and result to having an undesired project quality when the project is finally completed.

CONCLUSION

The ever increasing clients' and regulatory agencies' demands coupled with the high competition amongst contractors in the construction market make effective management of construction projects highly important. Contractors play a key role in successful completion of a construction project. It is quite essential to choose a competent contractor to implement the project. Choosing a qualified contractor increases the chances of successful completion of a project by achieving the client's goals of keeping the schedules of the cost, time and quality. It therefore became imperative to select a competent contractor to implement the project. This paper investigated the actual criteria used by clients for the selection of main contractors from current practice in Malaysia. It was found out that track performance, financial capacity and technical capacity were the top most important criteria used by clients for the selection of main contractors from current practice in Malaysia as perceived by the respondents. This paper provides supportive practical solution for Malaysian clients to enhance and improve their contractor selection processes

in order to have successful completion of construction projects that would meet their requirements and increase their satisfaction levels.

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