Contractor Selection Criteria for Construction Projects

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Abstract: Considering the complexity of a construction project, it is important to implement a systematic approach in selecting contractors, since, contractors are the one who is going to undertake critical project activities and has significant impact on project performance. Hence, to ensure that projects performance is not being put at risk, only capable contractors with critical success criteria should be selected without compromising project's outcome. This study is aimed to investigate the contractor selection criteria that should be used during the bid assessment process. Through a comprehensive literature review involving content analysis of various sources related to contractor selection criteria in construction projects around the globe, a total of 43 selection criteria divided into seven categories were identified. The result of this study is hoped to become a standardised reference in selecting contractor for construction projects apart from solely depending on contractor's offered price.

Key words: Contractor selection criteria, construction management, bid assessment, projects, significant, risk

INTRODUCTION

Contractors have a significant impact on project performance where prequalified and well selected contractor has potentials to deliver projects to acceptable quality standard within the scheduled time (Aje, 2012). This can eliminate unnecessary spending which is significantly a burden to the project funding. In addition, contractor's prequalification and selection procedure is a very complex decision-making process and failure to perform it can possibly lead to large losses, delays or severe harm to project quality (Attar *et al.*, 2013). This makes the selection process of the contractor for construction projects more complicated and critical. Therefore, this study suggests that contractors need to be evaluated from various angles and not solely on the price offered.

Contractor selection has captured high awareness amongst construction management research community and has been a highly-discussed issue over the past few years (Cristobal, 2011). For the ultimate purpose of developing a contractor selection framework, certain criteria need to be set which will be materialised via. this study. This is to ensure that, all vital attributes of the contactor are being assessed from various angles. Yong and Mustaffa (2012) showed that contractor's attributes play an important contribution to project success. Since contractor contributes a substantial role in the final project output, this study suggests that awarding

the most suitable contractor for projects is one of the critical tasks in any situation. Identifying the right contractor whom the decision maker confidently believed would have enough capability, responsibility and technical knowledge is the vital task in the selection process. Hence, it is significant to complement that complexity by presenting a review of contractor selection criteria for construction projects and this study is materialised in achieving the aim of investigating it which is hoped to becoming a standardised reference in selecting contactor.

Construction project: The construction industry and construction activities are known to be one of the key foundations of economic development and national growth (Khan, 2008). The industry had evolved over the time and today, the construction industry has become more matured, crucial and complicated. Ofori (2015) claimed that the impact of the construction industry to the economic expansion and long-term national development is generally recognised, particularly in developing countries. In fact, the growth of the industry in a country will informally be representing the growth of economics of that particular country.

It is, therefore, seen by this study that it is a challenging task to manage projects in the construction industry. They are constrained by cost, time and quality. Large engineering construction projects comprise numerous sorts of resources such as labour, materials

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and equipment which involve planning and strategy for effective operations and economic advantage (Sarker *et al.*, 2012). Most construction projects are unique in nature with the involvement of many conflicting parties. That is why, this study observes that many projects suffer cost over budget, time extensions and conflicts among parties if they are not being managed properly. With the increasing of complexity in managing a construction project, proper practices of project management knowledge need to be implemented by organisations which are further discussed in the succeeding study.

MATERIALS AND METHODS

Overview of project management: The complexity of construction projects leads to the emergence of the concept of project management which initially introduced in the 1950's (Crawford *et al.*, 2006). Project management is described by PMI (2013) as the application of knowledge, skills, tools and techniques to project activities to meet the project requirements. In addition, Anonymous (2012) defined project management as the application of processes, methods, knowledge, skills and experience to achieve the project objectives. Both are respectable organisations on project management. Thus, this study reckons that both definitions are quite parallel. Several project management theories and models have been developed over the time by many parties. Over the years, the way tasks were executed started to change. The way organisations performed their projects had changed from breaking down work into tasks, activities scheduling, cost controls and the allocation of resources. Today, the concept of project management has been expanded to almost all industries, particularly in the construction industry.

Project management is thus seen by this study as critical to a construction project. Systematic management will have a constructive effect; namely, the project can be completed within the specified time, quality and budget. The implementation of a project requires effective project management which involves several areas of knowledge. PMI (2016) stated that, there are 12 knowledge areas with relation to the construction industry; project integration management, project scope management, project schedule management, project cost management, project quality management, project resource management, project communication management, project risk management, project procurement management, project stakeholder management, project health, safety, security and environmental management as well as project financial management.

One essential process in the project procurement management, especially in the construction industry is the contractor selection process. Since contractors are responsible for undertaking the main activities in a project, the achievement level of any construction project can be said to depend mostly on selecting the most capable contractor (El-Abbasy *et al.*, 2013). Thus, it is important for project owner or consultant to identify and award projects to the appropriate contractor.

Contractor selection criteria: Construction activities are particularly prone to risks which affect final project performance. One of the most crucial tasks a construction client must face to realise an acceptable project result is selecting the right contractor. Comparing bid prices as the solitary criterion in selecting contractor, a common practice in many organisations is often criticised. Lowest price does not inevitably mean a benefit for the client as the quality and period of a construction project may be undermined (Jaskowski *et al.*, 2010). Puri and Tiwari (2014) stated that, the evaluation of bids by contractors might encounter some complications when comparing different criteria assessed by different gauges because different decision maker might have different criteria preference. Henceforth, it could be concluded that there is no agreement yet on a common set of selection criteria for selecting a contractor that may differ as per the nature of the project.

Since, contractor plays a significant role in the final project performance, selecting the best contractor for projects is the most critical challenge for any decision maker. Identifying the right contractor whom the decision maker confidently believed would have enough capability, responsibility and technical knowledge is the vital task in the selection process. Balubaid and Alamoudi (2015) claimed that multi criteria selection methods should be implemented in construction project management in the process of selecting a contractor. This is to ensure the best contractor is chosen to achieve project objectives which is to complete projects within the specified time, quality and budget.

In order to perform a thorough contractor selection process, several methods can be adopted. There are many multi-criteria techniques that have been proposed and applied in performing contractor's prequalification and selection (Alzober and Yaakub, 2014). Each method has their own advantages and disadvantages. A meta-analysis study on contractor's selection method which was conducted by Kog and Yaman (2014) shows that, some of the common methods used are statistical method, fuzzy set, analytical hierarchy, decision support system, artificial neural network and multi attribute

analysis. Mardani *et al.* (2015) claimed that contractor selection could be performed by the use of Multiple Attribute Decision Making (MADM) technique.

There are many contractor selection criteria that can be found in the literature but in real practice, this study suggests that clients may have their own different criteria. This part of the literature review is focusing on identifying critical selection criteria for selecting contractors for construction projects. Previous related studies have been reviewed via. content analysis and based on the result, it can be generalised that contractor selection criteria can be divided into seven main categories which are management capability, financial capacity, experience, resources, technical, Environmental Health and Safety (EHS) and others (Watt *et al.*, 2010; Alias *et al.*, 2011; Idrus *et al.*, 2011; Cristobal, 2011; El-Abbasy *et al.*, 2013; Jafari, 2013; Puri and Tiwari, 2014; Balubaid and Alamoudi, 2015; Nasab and Ghamsarian, 2015; Ibadov, 2015). This is further supported by studies that show that, management capability, past performance, technical ability, financial capacity and occupational health and safety were among important criteria used for the selection of contractors (Idrus *et al.*, 2011; Kog and Yaman, 2014; Nasab and Ghamsarian, 2015; Ibadov, 2015).

RESULT AND DISCUSSION

Several articles from previously published journals which discussed on the topic were reviewed and the result of the literature review is being summarised into seven main categories, namely the management capability, financial capacity, experience, resources, technical, environmental, health and safety and lastly others as shown in Table 1.

Management capability: As shown in Table 1, 8 out of 10 studies mention that management capability is one of the important criteria in evaluating contractors for construction projects. Through, the literature review, 6 sub criteria under management capability have been identified. In no particular order, Watt *et al.* (2010) identified project management, client and contractor relationship and contractor's reputation as components of management capability. Management capability, according to Puri and Tiwari (2014) includes the relationship between contractor and client, contractor's reputation, project management and the business experience of the organisation. However, Nasab and Ghamsarian (2015) claimed that 3 parameters are related to management capability, namely company image, client satisfaction and relationship. On the other hand, Ibadov (2015) only mentioned project management, El-Abbasy *et al.* (2013) mentioned client-contractor relationship and Cristobal (2011) indicated overall company management as their sub component of management capability, respectively.

Financial capacity: Financial capacity is another main selection criterion that has been identified in this study via. the literature review. About 9 out of 10 studies as summarised in Table 1 includes financial capacity in their discussion (Alias *et al.*, 2011; Idrus *et al.*, 2011; Cristobal, 2011; El-Abbasy *et al.*, 2013; Jafari, 2013; Puri and Tiwari, 2014; Balubaid and Alamoudi, 2015; Nasab and Ghamsarian, 2015; Ibadov, 2015). The most mentioned sub criteria is financial condition. It is observed by this study that 60% of the articles reviewed indicate financial condition as an important item. Finance guarantee or in other words, the ability to secure financing is the second important sub-criteria identified under the financial

Table 1 Summary of contractor selection criteria

Variables	Balubaid and Alamoudi (2015)	Ibadov (2015)	Nasab and Ghamsarian (2015)	Puri and Tiwari (2014)	Jafari (2013)	El-Abbasy *et al.* (2013)	Cristobal (2011)	Alias *et al.* (2011)	Idrus *et al.* (2011)	Watt *et al.* (2010)	Times referred
Management capability		x	x	x	x	x	x		x	x	8
Client-contractor relationship			x	x		x			x	x	5
Reputation			x	x	x					x	4
Project management		x		x						x	3
Company management					x		x		x		3
Client satisfaction			x								1
Length of time in business				x							1
Financial capacity	x	x	x	x	x	x	x	x	x		9
Financial condition			x	x	x	x	x		x		6

Table 1: Continue

Variables	Balubaid and Alamoudi (2015)	Ibadov (2015)	Nasab and Ghamsarian (2015)	Puri and Tiwari (2014)	Jafari (2013)	El-Abbasy et al. (2013)	Cristobal (2011)	Alias et al. (2011)	Idrus et al. (2011)	Watt et al. (2010)	Times referred
Financial guarantee		x	x	x							3
Company assets	x							x			2
Credit rating			x	x							2
Cash in hand			x			x					2
Financial management		x									1
Company turnover			x								1
Liability								x			1
Experience	x	x	x	x	x	x	x	x	x	x	10
Past job performance	x		x	x		x		x	x	x	7
Past similar experience	x	x	x	x	x	x			x		7
Staff experience			x	x	x	x		x			5
Experience in the region			x		x						2
Past failure			x	x							2
Size of past projects			x								1
No. of past projects			x								1
Resources	x		x	x	x	x		x	x	x	8
Equipment and tools	x		x	x	x	x		x			6
Technical manpower	x		x	x							3
Projects in hand	x								x	x	3
No. of staff	x		x								2
Progress of existing projects								x	x		2
Machinery	x										1
Technical ability	x	x	x	x	x		x	x	x	x	9
Company competency		x		x			x		x	x	5
Staff qualification		x		x				x			3
Quality management		x	x		x						3
Staff competency		x			x						2
Work method			x							x	2
Technology					x				x		2
Quality assurance		x									1
Environmental, health and safety		x	x	x		x	x		x		6
Health and safety management		x	x	x		x			x		5
Environmental management		x									1
Health and safety experience				x							1
Accident rate				x							1
Safety rate							x				1
Others											
Completion time						x	x		x		3
Risk management		x				x					2
Political consideration									x		1

capacity category. Other sub-criteria are company asset, cash in hand, credit rating, company turnover, financial management and company liability.

Experience: One of the most important contractor selection criteria mentioned by all researchers in this literature review as shown in Table 1 is contractor experience. Balubaid and Alamoudi (2015), Nasab and Ghamsarian (2015), Puri and Tiwari (2014), El-Abbasy *et al.* (2013), Alias *et al.* (2011), Idrus *et al.* (2011) and Watt *et al.* (2010) stated past job performance as one of the sub-criteria in assessing contractor. Furthermore, past similar experience is indicated by Balubaid and Alamoudi (2015), Ibadov (2015), Nasab and Ghamsarian (2015), Puri and Tiwari (2014), Jafari (2013), El-Abbasy *et al.* (2013) and Idrus *et al.* (2011). Another sub criteria that can be considered important is staff experience (Alias *et al.*, 2011; El-Abbasy *et al.*, 2013; Jafari, 2013; Puri and Tiwari, 2014; Nasab and Ghamsarian, 2015). Also included in the experience category are contractor experience in the region (Jafari, 2013; Nasab and Ghamsarian, 2015) and past failure (Puri and Tiwari, 2014). Finally, Nasab and Ghamsarian (2015) also mentioned about the size of past projects and number of past project in their argument.

Resources: Resources is another criterion that is highlighted in most of the studies reviewed as illustrated in Table 1. About 8 out of 10 studies reviewed include resources into their contractor selection evaluation. The first sub criterion emphasised in those studies is equipment and tools (Alias *et al.*, 2011; El-Abbasy *et al.*, 2013; Jafari, 2013; Puri and Tiwari, 2014; Balubaid and Alamoudi, 2015; Nasab and Ghamsarian, 2015). In addition to that, the literature review undertaken by this study also observed the terms technical manpower (Puri and Tiwari, 2014; Balubaid and Alamoudi, 2015; Nasab and Ghamsarian, 2015) and projects in hand (Watt *et al.*, 2010; Idrus *et al.*, 2011). Moreover, Nasab and Ghamsarian (2015) and Balubaid and Alamoudi (2015) include the number of staff into consideration in selecting the contractors. Other sub criteria under the resources category include progress of existing projects (Alias *et al.*, 2011; Idrus *et al.*, 2011) and machinery (Balubaid and Alamoudi, 2015).

Technical ability: This is another important criterion for assessing contractor for awarding project. Technical is one of the essential components since construction project requires high level of technical knowledge. The most important criterion identified under this category as in Table 1 is company competency. Ibadov (2015),

Puri and Tiwari (2014), Cristobal (2011), Idrus *et al.* (2011) and Watt *et al.* (2010) mentioned company competence in their studies. The next important sub criteria are staff qualifications (Alias *et al.*, 2011; Puri and Tiwari, 2014; Ibadov, 2015) and quality management (Jafari, 2013; Nasab and Ghamsarian, 2015; Ibadov, 2015). In addition, Ibadov (2015) and Jafari (2013) indicated staff competency in their studies, while Nasab and Ghamsarian (2015) and Watt *et al.* (2010) mentioned about working method. Other criteria included are technology (Jafari, 2013) and quality assurance.

Environmental, health and safety: These are also an essential part of the overall construction industry in ensuring safe working conditions for the construction researchers. It is not startling to see some studies include this criterion in their contractor selection framework. The most important criterion, based on the literature review as summarised in Table 1, is the health and safety management (Idrus *et al.*, 2011; El-Abbasy *et al.*, 2013; Puri and Tiwari, 2014; Nasab and Ghamsarian, 2015; Ibadov, 2015). Other criteria under the same category are environmental management (Ibadov, 2015) and safety rate (Cristobal, 2011). Lastly, Puri and Tiwari (2014) state health and safety experience and accident rate as their contractor selection criteria.

Others: There are another three criteria that were also discussed in the studies reviewed as summarised in Table 1. Ibadov (2015) and El-Abbasy *et al.* (2013) include risk management in their studies. Furthermore, Idrus *et al.* (2011), El-Abbasy *et al.* (2013) and Cristobal (2011) mentioned that time completion as one of the criteria that needs to be assessed in selecting a contractor for a construction project. Surprisingly, only Idrus *et al.* (2011) mentioned political consideration as an important criterion in assessing the contractors.

CONCLUSION

This study has successfully achieved its aim of investigating the critical contractor selection criteria for construction projects. From the literature review carried out via an extensive content analysis, it is found that 43 criteria had been identified by previous researchers as the critical contractor selection criteria. These criteria are then divided into seven main categories based on their theme which are; management capability, financial capacity, experience, resources, technical ability, Environmental, Health and Safety (EHS) and others. Further study is suggested, particularly in the area of analysing and obtaining a rank ordering of the contractor selection

criteria for construction projects. Several multi criteria decision making methods were suggested. They are the Analytical Hierarchy Process (AHP), the Preference Ranking Organisation Method for Enrichment of Evaluations (PROMETHEE), the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), the Multi-Attribute Utility Theory (MAUT) and other multi criteria decision making methods and tools. This will enable clients and project owner to prioritise and subsequently establish in depth understanding of each criterion. This study is expected to provide the industry with a general guideline in selecting contractors for construction projects. Nevertheless, localised studies need to be performed since different location and project environment might have different project objectives.

ACKNOWLEDGEMENTS

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